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An American National Standard

Standard Terminology Relating to Sampling and Analysis of Atmospheres[1,2]

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1. Scope

1.1 This terminology is a collective vocabulary relating to sampling and analysis of atmospheres. As a convenience to general interest, it contains most of the standard terms, definitions, and nomenclature under the jurisdiction of Committee D-22.

1.2 Many of the entries in this terminology are copied (with attribution) from the standards of origin referenced in Section 2. The standards of origin are noted in bold type at the right margin of the applicable definition.

1.3 Certain terms in the common language that comprise multiple concepts are included herein with the definition specific to standards and practices of Committee D-22.

2. Referenced Documents

2.1 *ASTM Standards:*

[1] This terminology is under the jurisdiction of ASTM Committee D22 on Sampling and Analysis of Atmospheres and is the direct responsibility of Subcommittee D22.01 on Quality Control.

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~~[2] See also Terminology D 4023 for terms relating to Humidity Measurements.~~

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

D 1357 Practice for Planning the Sampling of the Ambient Atmosphere[2]
D 3249 Practice for General Ambient Air Analyzer Procedures[2]
D 3614 Guide for Laboratories Engaged in Sampling and Analysis of Atmospheres and Emissions[2]
D 3631 Test Methods for Measuring Surface Atmospheric Pressure[2]
D 3670 Guide for Determination of Precision and Bias of Methods of Committee ~~D-22~~[3] D22[2]
D 3686 Practice for Sampling Atmospheres to Collect Organic Compound Vapors (Activated Charcoal Tube Adsorption Method)[2]
D 3687 Practice for Analysis of Organic Compound Vapors Collected by the Activated Charcoal Tube Adsorption Method[2]
D 4023 Terminology Relating to Humidity Measurements[2]
D 4096 Test Method for Determination of Total Suspended Particulate Matter in the Atmosphere (High-Volume Sampler Method)[2]
D 4240 Test Method for Airborne Asbestos Concentration in Workplace Atmosphere[3]
D 4298 Guide for Intercomparing Permeation Tubes to Establish Traceability[2]
D 5011 Practices for Calibration of Ozone Monitors Using Transfer Standards[2]
D 5015 Test Method for pH of Atmospheric Wet Deposition Samples by Electrometric Determination[2]
D 5096 Test Method for Determining the Performance of a Cup Anemometer or Propeller Anemometer[2]
D 5111 Guide for Choosing Locations and Sampling Methods to Monitor Atmospheric Deposition at Non-Urban Locations[2]
D 5366 Test Method for Determining the Dynamic Performance of a Wind Vane[2]
D 5438 Practice for Collection of Floor Dust for Chemical Analysis[2]
D 5527 Practices for Measuring Surface Wind and Temperature by Acoustic Means[2]
E 104 Practice for Maintaining Constant Relative Humidity by Means of Aqueous Solutions[2]

3. Terminology

absolute temperature—See **temperature.**
absolute filter—See **filter.**
absorbance, *n*—the logarithm to the base of 10 of the reciprocal of *transmittance.*
absorbate, *n*—material that has been retained by the process of absorption.
absorbent, *n*—material in which absorption occurs.
absorption, *n*—a process in which one material (the absorbent) takes up and retains another (the absorbate) with the formation of an homogeneous mixture having the attributes of a solution.

DISCUSSION—Chemical reaction may accompany or follow absorption.

acceptance angle (±α, deg), *n*—the angular distance, centered on the array axis of symmetry, over which the following conditions are met: (*a*) wind components are unambiguously defined, and (*b*) flow across the transducers is unobstructed or remains within the angular range for which transducer shadow corrections are defined. **D 5527**
accrediting authority, *n*—a body that evaluates the capability of a testing agency or an inspection agency, or both, in certain specific fields of activity. **D 3614**
accretion, *n*—a phenomenon consisting of the increase in size of particles by the process of external additions.
accuracy, *n*—the degree of conformity of a value generated by a specific procedure to the assumed or accepted true value and includes both precision and bias. **D 3670**
acoustic pathlength (*d,* (m)), *n*—the physical distance between transducer transmitter-receiver pairs. **D 5527**
activated charcoal, *n*—activated charcoal refers to properly conditioned coconut-shell charcoal. **D 3686**
adsorbate, *n*—material that has been retained by the process of adsorption.
adsorbent, *n*—solid material on the surface of which adsorption takes place.
adsorption, *n*—a physical process in which molecules of gas, of dissolved substances, or of liquids, adhere in an extremely thin layer to the surfaces of solid bodies with which they are in contact.
aerosol, *n*—a dispersion of solid or liquid particles in a gaseous medium.
agency, *n*—an organization or part of an organization engaged in the activities of testing or inspection, or both. **D 3614**
agglomeration, *n*—a process of contact and adhesion whereby the particles of a dispersion form clusters of increasing size.
air at normal conditions (standard air), *n*—air at 50 % relative humidity, 25°C and 101.3 kPa (77°F and 760 mm Hg). See also **atmosphere.**
air pollution, *n*—the presence of unwanted material in the air.

DISCUSSION—The term *unwanted material* here refers to material in sufficient concentrations, present for a sufficient time, and under circumstances to interfere significantly with comfort, health, or welfare of persons, or with the full use and enjoyment of property.

aliquot, *n*—a representative portion of the whole that can be expressed as the inverse of an integer.

[3] Discontinued; see *1995 Annual Book of ASTM Standards,* Vol 11.03.

ambient, *adj*—surrounding on all sides.

analyzer, *n*—the instrumental equipment necessary to perform automatic analysis of ambient air through the use of physical and chemical properties and giving either cyclic or continuous output signal. **D 3249**

analyzer system, n—all sampling, analyzing, and readout instrumentation required to perform ambient air quality analysis automatically. **D 3249**

full scale, n—the maximum measuring limit for a given range of an analyzer. **D 3249**

lag time, n—the time interval from a step change in the input concentration at the analyzer inlet to the first corresponding change in the analyzer signal readout. **D 3249**

linearity, n—the maximum deviation between an actual analyzer reading and the reading predicted by a straight line drawn between upper and lower calibration points.

DISCUSSION—This deviation is expressed as a percentage of full scale. **D 3249**

minimum detection limit, n—the smallest input concentration that can be determined as the concentration approaches zero. **D 3249**

noise, n—random deviations from a mean output not caused by sample concentration changes. **D 3249**

open path analyzer, n—an analytical system that measures the average atmospheric or emission compound concentration along one or more monitoring paths open to the atmosphere. See **monitoring path.**

operating humidity range of analyzer, n—the range of ambient relative humidity of air surrounding the analyzer, over which the analyzer will meet all performance specifications. **D 3249**

operating temperature range of analyzer, n—the range of ambient temperatures of air surrounding the analyzer, over which the monitor will meet all performance specifications. **D 3249**

operational period, n—the period of time over which the analyzer can be expected to operate unattended within specifications. **D 3249**

output, n—a signal that is related to the measurement, and intended for connection to a readout or data acquisition device.

DISCUSSION—Usually this is an electrical signal expressed as millivolts or milliamperes full scale at a given impedance. **D 3249**

range, n—the concentration region between the minimum and maximum measurable limits. **D 3249**

readout instrumentation, n—output meters, recorder, or data acquisition system for monitoring analytical results. **D 3249**

response time, n—the time interval from a step change in the input concentration at the analyzer inlet to an output reading of 90 % of the ultimate reading. **D 3249**

rise time, n—response time minus lag time. **D 3249**

sample system, n—equipment necessary to provide the analyzer with a continuous representative sample. **D 3249**

span drift, n—the change in analyzer output over a stated time period, usually 24 h of unadjusted continuous operation, when the input concentration is at a constant, stated upscale value.

DISCUSSION—Span drift is usually expressed as a percentage change of full scale over a 24-h operational period. **D 3249**

zero drift, n—the change in analyzer output over a stated time period of unadjusted continuous operation when the input concentration is zero; usually expressed as a percentage change of full scale over a 24-h operational period. **D 3249**

See also **point analyzer.**

analyzer system—See **analyzer.**

arrester, *n*—a term for an air cleaning device.

aspirated psychrometer—See **psychrometer.**

aspirator, *n*—any apparatus such as a squeeze bulb, fan, pump, or venturi that produces a movement of a fluid by suction.

atmosphere, *n*—the gaseous envelope which surrounds the earth and includes ambient air, indoor air, and workplace air. See also **air at normal conditions.**

synthetic atmosphere, n—a specific gaseous mass containing any number of constituents and in any proportion produced for a special purpose.

backdrafting, *n*—the reversal of the normal (upward) direction of air flow in a vent for a vented combustion appliance (boiler, fireplace, furnace, or water heater), when the vented appliance is operating.

bias, *n*—a systematic (nonrandom) deviation of the method average value or the measured value from an accepted value. **D 3670**

laboratory bias, n—systematic differences between the true value and a value reported by a laboratory due to errors of application such as losses, contamination, miscalibration, and faulty manipulations, for example. **D 3670**

method bias, n—systematic departures of the limiting mean from the true value of the parameter measured caused by physical or chemical phenomena inherent in the methodology. **D 3670**

breathing zone, *n*—that location in the atmosphere at which persons breathe.

bubbler, *n*—a sampling device consisting of a gas disperser immersed in an absorbing liquid.

fritted bubbler, n—a bubbler having a frit as the gas disperser.

candidate method, *n*—an analytical method or measurement process being considered for standardization.

DISCUSSION—A method is a *candidate* until completion of all phases of the consensus process specified by ASTM regulations for a proposal, an emergency standard, or a standard. **D 3670**

cascade impactor—See **impactor.**

carpet-embedded dust—See **dust.**

chemisorption, *n*—adsorption, especially when irreversible, by means of chemical forces in contrast with physical forces.

chimney effect, *n*—a phenomenon consisting of a vertical movement of a localized mass of air or other gases due to temperature differences.

cloud, *n*—any collection of particulate matter in the atmosphere dense enough to be perceptible to the eye, especially a collection of water drops.

cloud water, n—an aggregate of condensed water vapor or ice crystals that are suspended in the atmosphere.

DISCUSSION—Cloud water droplet sizes are typically less than those of precipitation, measuring between 1 and 100 μm in diameter. **D 5111**

cloud water—See **cloud.**

coalescence, *n*—a process by which the particles of a dispersion combine into one body.

collaborative test, *n*—an interlaboratory study of a test method wherein the participants analyze or make measurements on subsamples of the same test material.

DISCUSSION—If the test method includes the sampling of atmospheres, the participants should sample the same test atmosphere, as possible. **D 3670**

collection efficiency—See **efficiency.**

collector, *n*—a device for removing and retaining contaminants from air or other gases.

DISCUSSION—Usually this term is applied to cleaning devices in exhaust systems.

colorimeter, *n*—an instrument used for color measurement based on optical comparison with standard colors.

combustion system downdrafting, *n*—the reversal of the ordinary (upward) direction of air flow in a combustion system when vented combustion appliances are not operating.

DISCUSSION—The term "cold backdrafting" is used synonymously with combustion system downdrafting.

combustion system spillage, *n*—entry of combustion products into a building, caused by backdrafting, vent blockage, or a leaky heat exchanger.

concentration, *n*—the quantity of a substance contained in a total unit quantity of sample.

mass concentration, n—concentration expressed in terms of mass of substance per unit volume of gas or liquid.

ppb(v), n—a unit of measure of the concentration of gases in air expressed as parts of the gas per billion (10^9) parts of the air-gas mixture, both by volume.

ppm(v), n—a unit of measure of the concentration of gases in air expressed as parts of the gas per million parts of the air-gas mixture, both by volume.

vapor concentration, n—concentration expressed in terms of gaseous volume of substance per unit volume of air or other gas usually expressed in percent or parts per million by volume. See also **absolute humidity.**

volume concentration, n—concentration expressed in terms of gaseous volume of substance per unit volume of air or other gas usually expressed in percent or parts per million.

condensate, *n*—liquid or solid matter formed by condensation from the vapor phase.

DISCUSSION—In sampling, the term is applied to the components of an atmosphere which have been isolated by simple cooling.

condensation, *n*—the process of converting a material in the gaseous phase to a liquid or solid state by decreasing temperature or by increasing pressure, or both.

DISCUSSION—Usually in air sampling only cooling is used.

condensation sampling—See **sampling.**

condensoid, *n*—the particles of a dispersion formed by condensation.

constant flow high-volume sampler—See **sampler.**

contaminant, *n*—a material added by human or natural activities which may, in sufficient concentrations, render the atmosphere unacceptable.

DISCUSSION—Contaminants refer to gases, vapors, mists, aerosols, fumes, particles, or dusts, and so forth, that are airborne. The term does not apply to elements that make up the components of the earth's atmosphere, such as nitrogen, oxygen, argon, and so forth. **D 1357**

continuous sampling—See **sampling.**

controlled-pore filter—See **filter.**

count median size, *n*—a measurement of particle size of samples of particulate matter, consisting of that diameter of particle such that one half of the number of particles is larger and half is smaller.

cumulative sample—See **sample.**

delay distance *(D), n*—the distance the air flows past a wind vane during the time it takes the vane to return to 50 % of the initial displacement. **D 5366**

density, *n*—the mass per unit volume of substance.

denuder, *n*—a device designed to collect or remove gases from an air stream by diffusion to a collecting surface or secondary air stream while permitting the passage of particles. **D 5111**

deposition, *n*—the transfer of an atmospheric constituent to a surface due to gravity or another mechanism, or the material which is transferred.

dry deposition, n—all forms of deposition derived from the net vertical transfer of chemical species to a surface that are not the result of precipitation.

DISCUSSION—Dry deposition includes both turbulent diffusion and gravitational settling. Dew and frost are anomalous forms of dry deposition which rely upon a near-surface condensation process as their principle means of effecting the net vertical transfer. **D 5111**

wet deposition, n—the precipitation of water from the atmosphere in the form of hail, rain, sleet, and snow.

DISCUSSION—Deposits of dew, fog, and frost are excluded. See also *meteorological precipitation* under **precipitation.** **D 5111**

desorption, *n*—the process of freeing from a sorbed state.

dew, *n*—water vapor that has condensed onto a surface near the ground because of radiational cooling of that surface to a temperature that is below the dew point of the air surrounding the surface. **D 5111**

dew cell, dew probe, *n*—an instrument that measures the temperature at which a saturated salt solution (usually of lithium chloride) is in equilibrium with the water vapor in moist air. **D 4023**

dew-/frost-point hygrometer—See **hygrometer.**

dew-point temperature—See **temperature.**

dew probe—See **dew cell.**

diffusion, molecular—See **molecular diffusion.**

dispersion, *n*—the most general term for a system consisting of particulate matter suspended in a fluid.

dispersoid, *n*—the particles of a dispersion.

distance constant *(L, m), n*—the distance the air flows past a rotating anemometer during the time it takes the cup wheel or propeller to reach *(1 − 1/e)* or 63 % of the equilibrium speed after a step change in wind speed.

DISCUSSION—The response of a rotating anemometer to a step change in which wind speed increases instantaneously from $U = 0$ to $U = U_f$, is:

$$U_t = U_f(1 - e(-t/\Gamma))$$

where

U_t	=	instantaneous indicated wind speed at time t, m/s,
U_f	=	final indicated wind speed, or wind tunnel speed, m/s,
t	=	elapsed time after the step change occurs, s, and
Γ	=	time constant of the instrument.

Distance constant is: $L = U_f\Gamma$ **D 5096**

diurnal, *adj*—recurring daily.

DISCUSSION—Applied to (variations in concentration of air contaminants, diurnal indicates variations that follow a distinctive pattern and which recur from day to day.

DOP, *n*—dioctyl phthalate (di-2-ethylhexyl phthalate).

droplet, *n*—a small liquid particle of such size and density as to fall under still conditions but which may remain suspended under turbulent conditions.

dry-bulb temperature—See **temperature.**

dry deposition—See **deposition.**

dry impingement—See **impingement.**

dust, *n*—a general term, depending upon application, applied to solid particles predominantly larger than colloidal and capable of temporary suspension in air or other gases.

DISCUSSION—Dusts tend to flocculate under electrostatic forces and settle under the influence of gravity. They are typically formed from larger masses through the application of physical forces.

dust loading, n—an engineering term for *dust concentration,* usually applied to the contents of collection ducts and the emissions from stacks.

carpet-embedded dust, n—soil and other particulate matter, approximately 5-µm equivalent aerodynamic diameter and larger, embedded in carpet pile and normally removable by household vacuum cleaners. **D 5438**

surface dust, n—soil and other particulate matter, approximately 5-µm equivalent aerodynamic diameter and larger, adhering to floor surfaces and normally removable by household vacuum cleaners. **D 5438**

dustfall—See *particle fall* under **particle.**
dust loading—See **dust.**
efficiency, *n*—a measure of the performance of a collector.

DISCUSSION—Usually it is the ratio of the amount collected to the inlet loading, expressed in percentage.

collection efficiency, n—the percentage of a specified substance retained by a gas cleaning or sampling device.
fractional efficiency, n—the mean collection efficiency for specific size fractions of a contaminant.

DISCUSSION—Commonly this term has been applied to the performance of air cleaning equipment towards particulate matter in various size ranges.

ejector, *n*—a device that uses a fluid under pressure, such as steam, air, or water, to move another fluid by developing suction through differential pressure.

DISCUSSION—Suction is developed by discharging the fluid under pressure through a venturi.

electrical conductivity, *n*—the property of a fluid or solid that permits the passage of an electrical current as a result of an impressed emf.

DISCUSSION—It is measured by the quantity of electricity transferred across unit area per unit potential gradient per unit time. (In sampling and analysis, changes in this property are utilized to measure the presence of certain ions and compounds such as sulfur dioxide.)

electric hygrometer—See **hygrometer.**
electrostatic precipitation—See **precipitation.**
electrostatic precipitator—See **precipitator.**
elute, *v*—to remove sorbed materials from a sorbent by means of a fluid.
emission mixture, *n*—the total mixture in the outside atmosphere of emissions from all sources.
emissions, *n*—substances discharged into the air from a stack, vent, or other discrete source.
emission rate, n—the mass emitted per unit of time from a source or, alternatively, per unit of material or energy produced or consumed by a process.
enhancement factor, *n*—the correction for the departure of the mixture of air and water vapor from ideal gas laws. **D 4023**
event sampling—See **sampling.**
exposure, *n*—contact with a chemical, biological, physical or other agent over a specified time period.

DISCUSSION—Exposure is expressed as the integral of the concentration (or intensity) of the agent at the boundary of the receptor over the time period of contact, that is, E∼=∼∫ ⊞dt

filter, *n*—a porous medium for collecting particulate matter.
absolute filter, n—a filter or filter medium of ultra-high collection efficiency for very small particles (submicrometre size) so that essentially all particles of interest or of concern are collected.

DISCUSSION—Commonly, the efficiency is in the region of 99.95 % or higher for a standard aerosol of 0.3-μm diameter (see Practice D 2986). **D 4096**

controlled-pore filter, n—a filter of various plastics or metals having a structure of controlled uniform pore size.

DISCUSSION—Sometimes referred to as a membrane or molecular filter.

flocculation, *n*—synonymous with agglomeration.
flowmeter, *n*—an instrument for measuring the rate of flow of a fluid (that is, liquid or gas) moving through a system.

DISCUSSION—The instrument is calibrated to give volume or mass rate of flow.

fly ash, *n*—the finely divided particles of ash entrained in flue gases arising from the combustion of fuel.

DISCUSSION—The particles of ash may contain incompletely burned fuel. The term has been applied predominantly to the gas-born ash from boilers with spreader stoker, underfeed stoker, and pulverized fuel (coal firing).

fog, *n*—a visible aggregate of condensed water vapor or ice crystals suspended in the atmosphere near the earth's surface.

DISCUSSION—Fog differs from cloud water only that it resides very close to the earth's surface. **D 5111**

fractional efficiency—See **efficiency.**
fractionation, *n*—the process of separating a mixture into components having different properties (as by distillation, precipitation, or screening).
frit, *n*—a porous material permeable to gas flow usually made by sintering microbeads of an appropriate material.
fritted bubbler—See **bubbler.**
frost, *n*—ice crystals resulting from the direct sublimation of water vapor onto a surface that is below freezing.

DISCUSSION—Frost is due to radiational cooling and only occurs when the temperature of the air in contact with the surface falls below the freezing point of water. **D 5111**

frost-point hygrometer—See **dew-/frost-point hygrometer** under **hygrometer.**
frost-point temperature—See **temperature.**
full scale—See **analyzer.**
fume, *n*—properly, the solid particles generated by condensation from the gaseous state, generally after volatilization from melted substances, and often accompanied by a chemical reaction such as oxidation.

DISCUSSION—Fumes flocculate and sometimes coalesce. Popularly, the term is used in reference to any or all types of contaminant, and in many laws or regulations with the added qualification that the contaminant have some unwanted action.

gage pressure—See **pressure.**
gas, *n*—one of the states of matter, having neither independent shape nor volume and tending to expand indefinitely.
gas meter, *n*—an instrument for measuring the quantity of a gas passing through the meter.
gasometer, *n*—an apparatus employing a calibrated volume which is used to calibrate gas-measuring devices.
generic criteria, *n*—common characteristics pertaining to organizations' human resources, material resources, and quality systems which provide a basis for assessing the qualifications of testing or inspection agencies. **D 3614**
gustiness, *adj*—now referred to as intensity of turbulence which is defined as the ratio of the root mean square of wind velocity fluctuations to the mean wind velocity.
Hi-Vol (high-volume air sampler)—See **sampler.**
house depressurization, *n*—the situation, pertaining to a specific location in a house, whereby the static pressure at that location is lower than the static pressure in the immediate vicinity outside the house.

DISCUSSION—The pressure difference between indoors and outdoors is affected by building tightness (including the distribution of leakage sites across the building envelope), indoor temperature difference, local winds, and the operation of indoor appliances such as exhaust fans, forced-air system fans, and vented combustion appliances (boilers, fireplaces, furnaces, or water heaters). The existence and extent of house depressurization at a specific location, thus, varies over time depending on outdoor conditions and the operation of indoor appliances.

human resources, *n*—those elements of support or capability that are provided by humans using their mental and physical capabilities. **D 3614**
humidity, *n*—a measure of the amount of water vapor in a gas. Also see **absolute humidity** and **relative humidity.**
absolute humidity, vapor concentration, vapor density (d_v), n—the ratio of the mass of water vapor, m_v, to the total volume of the moist air, *v:*

$$d_v = \frac{m_v}{v}$$

D 4023

relative humidity, n—the ratio of the actual water vapor pressure to the saturation pressure.
relative humidity with respect to ice (U_i), n—the ratio in percent of the mole fraction of water vapor, x_v, in moist air to the mole fraction of water vapor, x_{vi}, that the moist air would have if it were saturated with respect to ice at the same pressure, p, and temperature, t.

$$U_i = \frac{X_v}{X_{vi}} \times 100$$

DISCUSSION—If the water vapor and air are assumed to behave as ideal gases, then

$$U_i = \frac{e}{e_i} \times 100$$

where e is the partial pressure of the water vapor in the moist air and e_i is the saturation vapor pressure with respect to ice at the same temperature, t. **D 4023**

relative humidity with respect to water (U_w)—the ratio in percent of mole fraction of water vapor, x_v, in moist air to the mole fraction of water vapor, x_{vw}, that the moist air would have if it were saturated with respect to water at the same pressure, p, and temperature, t

$$U_w = \frac{X_v}{X_{vw}} \times 100$$

DISCUSSION—If water vapor and air are assumed to behave as ideal gases, then

$$U_w = \frac{e}{e_w} \times 100$$

where
e = partial pressure of the water vapor in the moist air and
e_w = saturation vapor pressure with respect to water at the same temperature, *t.*

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relative humidity with respect to ice—See **relative humidity.**

relative humidity with respect to water—See **relative humidity.**

humidity range—See **operating humidity range of analyzer** under **analyzer.** See also **operating humidity range of sample** under **sample.**

hygrometer, *n*—an instrument for measuring the humidity of a gas.

dew-/frost-point hygrometer, n—an instrument that measures the surface temperature at which ambient water vapor condenses. **D 4023**

electric hygrometer, n—an instrument that determines the water vapor content of an atmosphere by measuring the change in resistance or capacitance of hygroscopic material. **D 4023**

mechanical hygrometer, n—an instrument for determining the water vapor content of an atmosphere by measuring the dimensional change produced in an hygroscopic material. **D 4023**

ice-bulb temperature—See **temperature.**

impaction, *n*—a forcible contact of particles of matter, a term often used synonymously with impingement.

impactor, *n*—a device for collecting airborne or emission particulate matter in which the air or gas being sampled is impacted or impinged against a surface.

cascade impactor, n—a type of impactor which employs several stages of impaction in series to collect successively smaller sizes of particles.

impingement, *n*—the act of bringing matter forcibly in contact.

DISCUSSION—As used in air sampling, impingement refers to a process for the collection of particulate matter in which the gas being sampled is directed forcibly against a surface.

dry impingement, n—the process of impingement carried out so that particulate matter carried in the gas stream is retained upon the surface against which the stream is directed.

DISCUSSION—The collecting surface may be treated with a film of adhesive.

wet impingement, n—the process of impingement carried out within a body of liquid, the latter serving to retain the particulate matter.

impinger, *n*—broadly, a sampling instrument employing impingement of the collection of particulate matter.

DISCUSSION—Commonly, this term is applied to specific instruments, the *midget* and *standard* Impinger.

midget impinger, n—a specific instrument employing wet impingement, using a liquid volume of 10 mL and a gas flow of 2.8 L/min.

DISCUSSION—See Littlefield, J. R., Feicht, E. L., and Schrenk, H. H., "Midget Impinger for Dust Sampling," *Report of Investigations 3360,* U.S. Bureau of Mines, 1937.

standard impinger, n—a specific instrument employing wet impingement, using a liquid volume of 75 mL and a gas flow of 28 L/min.

DISCUSSION—See Greenburg, L., and Smith, G. W., "A New Instrument for Sampling Aerial Dust," *Report of Investigations 2392,* U.S. Bureau of Mines, 1922. See also Hatch, T., Warren, H., and Drinker, P., *Journal Industrial Hygiene,* No. 14, 1932, p. 301.

inspection, *n*—the process of measuring, examining, testing, gaging, or otherwise evaluating materials, products, services, systems, or environments. **D 3614**

instantaneous sampling—See **sampling.**

interference, *n*—an undesired output caused by a substance or substances other than the one being measured.

DISCUSSION—The effect of interfering substance(s), on the measurement of interest, shall be expressed as: (±) percentage change of measurement compared with the molar amount of the interferant. If the interference is nonlinear, an algebraic expression should be developed (or curve plotted) to show this varying effect. **D 3249**

intermittent sampling—See **sampling.**

inversion, *n*—a reversal of the normal atmospheric temperature gradient, thus an increase of temperature of the air with increasing altitude.

isokinetic sampling—See **sampling.**

laboratory bias—See **bias.**

lag time—See **analyzer.**

lapse rate, *n*—the rate of change of the absolute value of any meteorological element with increase of height.

DISCUSSION—When used without modifier, it refers to the rate of decrease of temperature with increase of height.

linearity—See **analyzer.**

mass concentration—See **concentration.**

mass median size, *n*—a measurement of particle size for samples of particulate matter, consisting of that diameter such that the

mass of all larger particles are equal to the mass of all smaller particles.

mechanical hygrometer—See **hygrometer.**

method bias—See **bias.**

meteorological precipitation—See **precipitation.**

method detection limit, *n*—the minimum concentration of an analyte that can be reported with a 99 % confidence that the valve is above zero, based on a standard deviation of greater than seven replicate measurements of the analyte in the matrix of concern at a concentration near the low standard.

microclimatology, *n*—the science that deals with the climate of restricted areas and investigates their phenomena and causes.

micrometeorology, *n*—the study of the meteorological characteristics of a local site that is usually small and often is confined to a shallow layer of air next to the ground.

midget impinger—See **impinger.**

minimum detection limit—See **analyzer.**

mist, *n*—liquid, usually water in the form of particles suspended in the atmosphere at or near the surface of the earth; small water droplets floating or falling, approaching the form of rain, and sometimes distinguished from fog as being more transparent or as having particles perceptibly moving downward.

mixing ratio *(r),* *n*—the ratio of the mass of water vapor m_v to the mass of dry air m_a, present in the moist air;

$$r=\frac{m_v}{m_a} \quad (1)$$

D 4023

molecular diffusion, *n*—a process of spontaneous intermixing of different substances, attributable to molecular motion and tending to produce uniformity of concentration.

mole fraction, *n*—the ratio of the number of molecules (or moles) of a compound or element to the total number of molecules (or moles) present.

DISCUSSION—If all substances concerned are in the gaseous state, and if all may be assumed to behave as perfect gases, the mole fraction is identical numerically to the volume concentration.

mole fraction of water vapor (x_v), n—the ratio of the number of moles of water vapor, n_v, to the total number of moles of water and dry air:

$$x_v=\frac{n_v}{n_v+n_a}$$

where:

$$n_v=\frac{m_v}{M_v}$$

$$n_a=\frac{m_a}{M_a}$$

and where M_v and M_a, = molecular weights of water vapor and air, respectively. **D 4023**

monitor, *n*—a device that continually measures or intermittently samples and analyzes atmospheres or emissions for the concentration of a specific constituent or constituents, or for the level of a physical property (such as temperature) to provide either a real-time read-out or an electrical signal.

continuous monitor, n—a device for the uninterrupted measurement of atmospheric or emission concentrations or properties in real or near-real time.

DISCUSSION—Such monitors are often automated and combine the collection of the sample with immediate or near-instantaneous analysis.

monitoring path—See **point analyzer.**

monitoring path length—See **point analyzer.**

month, *n*—for reporting analyses of outdoor air on a monthly rate, results are calculated to a base of thirty days.

noise—See **analyzer.**

non-hygroscopic material, *n*—material which neither absorbs nor retains water vapor. **E 104**

nonvolatile organic chemical—See **organic chemical.**

odor, *n*—that property of a substance which affects the sense of smell; any smell; scent; perfume.

odor threshold, n—the concentration of an odorous compound at which the physiological effect elicits a response 50 % of the time.

odor threshold—See **odor.**

odorant, *n*—odorous substance.

off-axis response ($U/(U_f \cos \theta)$), *n*—the ratio of the indicated wind speed (U) at various angles of attack θ to the indicated wind speed at zero angle of attack (U_f) multiplied by the cosine of the angle of attack.

DISCUSSION—This ratio compares the actual off-axis response to a cosine response. **D 5096**

olfactory, *adj*—of, relating to, or connected with the sense of smell.

opacity, *n*—a measure of the degree to which the intensity of light is reduced as it passes through a gas, due to absorption and scattering.

DISCUSSION—The degree to which the view of an object against the background is obscured increases with increasing opacity.

operating humidity range of analyzer—See **analyzer.**

operating humidity range of sample—See **sample.**

operating temperature range of analyzer—See **analyzer.**

operating temperature range of sample—See **sample.**

operational period—See **analyzer.**

optical measuring path length, *n*—the length of the optical beam over which the atmosphere or emission concentration is measured and averaged.

organic chemical, *n*—a carbon-based compound in which the element carbon is attached to other carbon atom(s), hydrogen, oxygen, or other elements in a chain, ring, or three-dimensional structure.

DISCUSSION—Oxides of carbon, such as carbon dioxide and carbonates, are not classified as organic compounds.

nonvolatile organic chemical, n—an organic compound with a saturation vapor pressure less than 10^{-8} kPa at 25°C.

polar organic chemical, n—an organic compound that may exhibit a relatively high electric dipole moment or may be readily ionized, typically containing heteroatoms, such as oxygen, sulfur, nitrogen, phosphorus, chlorine, and bromine.

DISCUSSION—A polar organic chemical is usually more water soluble and often more reactive than a nonpolar compound of similar molecular structure.

semivolatile organic chemical, n—an organic compound with a saturation vapor pressure between 10^{-2} and 10^{-8} kPa at 25°C.

volatile organic chemical, n—an organic compound with a saturation vapor pressure greater than 10^{-2} kPa at 25°C.

organizational component, *n*—a portion of an organization with specific tasks and activities that constitutes a part of the total effort and accomplishment of the organization.

D 3614

orifice meter, *n*—a flowmeter, employing as the measure of flow rate the difference between the pressures measured on the upstream and downstream sides of the orifice (that is, the pressure differential across the orifice) in the conveying pipe or duct.

output—See **analyzer.**

overall precision—See **precision.**

overshoot, *n* **(θ_n)**—the amplitude of a deflection of a wind vane as it oscillates about θ_B after release from an initial displacement.

D 5366

overshoot ratio, n (Ω)—the ratio of two successive overshoots of a wind vane, as expressed by the following equation:

$$\Omega = \frac{\theta_{(n+1)}}{\theta_n}$$

where θ_n and $\theta_{(n+1)}$= n and n + 1 overshoots, respectively.

DISCUSSION—In practice, since deflections after the first (to the side opposite the release point) are normally small, the initial release point (that is, n = 0 deflection) and the first deflection after release (n = 1) are used in determining the overshoot ratio. **D 5366**

particle, *n*—a small discrete mass of solid or liquid matter.

particle concentration, n—concentration expressed in terms of number of particles per unit volume of air or other gas.

DISCUSSION—On expressing particle concentration, the method of determining the concentration should be stated.

particle fall, n—a measurement of air contamination consisting of the mass rate at which solid particles deposit from the atmosphere.

DISCUSSION—A term used in the same sense as the older terms *dustfall* and *soot fall* but without any implication as to nature and source of the particles.

particle size, n—an expression for the size of liquid or solid particles expressed as the average or equivalent diameter.

particle size distribution, n—the relative percentage by mass, surface area, volume, number, or other property of each of the different size fractions of particulate matter.

particle concentration—See **particle.**

particle fall—See **particle.**

particle size—See **particle.**

particle size distribution—See **particle.**

particulate, *adj*—pertaining to or composed of particles.

personal sample—See **sample.**

***p*H,** *n*—the negative logarithm to the base ten of the conventional hydrogen ion activity. **D 5015**

permissible exposure limit (PEL), *n*—an OSHA defined term meaning the limit of OSHA permitted exposure to a specific contaminant as required in the applicable regulation. This limit is an 8–h time weighted average (TWA), determined in the worker's breathing zone, and is expressed in a number of units of measure — see applicable contaminant regulation.

phase distribution, *n*—the partitioning of a semivolatile chemical compound between the gaseous (vapor) and the particle-associated phases in the atmosphere.

DISCUSSION—Compounds, particularly semivolatile compounds (that is, those having saturation vapor pressures between 10^{-2} and 10^{-8} kPa at 25°C), may simultaneously exist in ambient and indoor air distributed between the gaseous and condensed phases, usually being sorbed in the latter case onto suspended particulate matter. This distribution may be substantially perturbed by traditional sampling methods that employ particle filters backed up by vapor traps. Therefore, the original distribution in the air at the time of sampling cannot readily be determined without the use of denuders or other effective gas-particle separators. This definition is not intended to apply to the distribution between the gaseous and pure solid or liquid forms of an airborne compound that may occur at, or near, a source or between the compound in the gaseous or particle-sorbed states, or both, and rain or fog droplets.

photochemical reaction, *n*—any chemical reaction that is initiated as a result of absorption of light.

photochemical smog, *n*—a type of air pollution resulting from photochemical reactions.

point analyzer, *n*—See also **analyzer.**

monitoring path, n—the actual path over which an atmospheric or an emission compound concentration is measured and averaged.

monitoring path length, n—the length of the monitoring path over which the average atmosphere or emission compound concentration is measured and averaged using an open path analyzer.

ppb(v)—See **concentration.**

ppm(v)—See **concentration.**

precipitation, *n*—separation of a new phase from solid, liquid, or gaseous solutions, usually with changing conditions of temperature or pressure, or both.

electrostatic precipitation, n—a process consisting of the separation of particulate matter from air or other gases under the influence of an electrostatic field.

meteorological precipitation, n—the precipitation of water from the atmosphere in the form of hail, mist, rain, sleet, and snow.

DISCUSSION—Deposits of dew, fog, and frost are excluded.

thermal precipitation, n—a process consisting of the separation of particulate matter from air and other gases under the influence of a relatively large temperature gradient extending over a short distance.

DISCUSSION—In the thermal precipitator (a sampling instrument), the air or gas is drawn slowly through a narrow chamber across which extends a heated wire, particulate matter being deposited upon the adjacent collecting surface.

ultrasonic precipitation, n—a process consisting of the separation of particulate matter from air and other gases following agglomeration induced by an ultrasonic field.

precipitator, *n*—a device or apparatus for the separation of particulate matter from air or other gases.

DISCUSSION—The apparatus may be utilized either for sampling particulate matter or for removing particulate matter from ambient, indoor or workplace atmospheres, or from emission sources.

electrostatic precipitator, n—apparatus employing electrostatic precipitation for the separation of particles from a gas stream.

DISCUSSION—The apparatus may be designed either for sampling or for cleaning large volumes of gas.

thermal precipitator—See **precipitation.**

precision, *n*—the degree of agreement of repeated measurements of the same property, expressed in terms of dispersion of test results about the mean result obtained by repetitive testing of a homogenous sample under specified conditions.

DISCUSSION—The precision of a method is expressed quantitatively as the standard deviation computed from the results of a series of controlled determinations.

overall precision, n—a value including components of within-laboratory and between-user variability. **D 3670**

single-operator precision, n—a measure of the replication of repeated measurements obtained by a single operator on a given sample.

DISCUSSION—Other classifications of precision which are useful in evaluating a method, a measurement, or performance within a single laboratory are: multioperator precision, single or multi-apparatus precision, and single or multi-day precision.

DISCUSSION—The terms *repeatability* and *reproducibility* are not standardized, but have generally become to mean *single-laboratory-operator-material precision* and *multilaboratory-multi-operator-single-material precision*, respectively. Such use is maintained in the text of this practice.

DISCUSSION—Further classifications of bias which are useful in evaluating performance are: operator bias, apparatus bias, and day bias. **D 3670**

pressure, *n*—the force or load per unit area.

gage pressure, n—the difference in pressure between that existing within a system and that of the surrounding atmosphere.

DISCUSSION—Zero gage pressure is equal to atmospheric pressure.

static pressure, n—the pressure of a fluid at rest, or in motion, exerted perpendicularly to the direction of flow.

total pressure, n—the pressure representing the sum of static pressure and velocity pressure at the point of measurement.

velocity pressure, n—that pressure caused by and related to the velocity of the flow of fluid; a measure of the kinetic energy of the fluid.

primary standard—See **standard.**

primary flow-rate standard—See **standard.**

probe, *n*—a tube used for sampling or for measuring pressures at a distance from the actual collection or measuring apparatus.

DISCUSSION—It is commonly used for reaching inside stacks and ducts.

psychrometer, *n*—a variety of hygrometer comprising a dry bulb thermometer and a wet bulb thermometer, which, when suitably aspirated, indicates the thermodynamic wet- and dry bulb temperature of the gas.

aspirated psychrometer, n—an hygrometer comprising wet- and dry-bulb thermometers that are mounted in a housing to which is attached a motor-driven fan or blower that draws air over the thermometer bulbs at a rate which produces the minimum wet-bulb reading. **D 4023**

sling (whirling) psychrometer, n—an hygrometer comprising wet- and dry-bulb thermometers that are mounted on a frame that can be rotated or whirled. **D 4023**

quality, *n*—the totality of features and characteristics of a product or service that bear on its ability to satisfy a given need. **D 3614**

quality assurance, n—a system of activities whose purpose is to provide assurance that the overall quality control job is in fact being done effectively.

DISCUSSION—The system involves a continuing evaluation of the adequacy and effectiveness of the overall quality control program (see *quality control*) with a view to having corrective measures initiated where necessary. For a specific product or service, this involves verifications, audits, and the evaluation of the quality factors that affect the specification, production, inspection, and use of the product or service. **D 3614**

quality control, n—the overall system of activities whose purpose is to provide a quality of product or service that meets the needs of users; also, the use of such a system.

DISCUSSION—The aim of quality control is to provide quality that is satisfactory, adequate, dependable, and economic. The overall system involves integrating the quality aspects of several related steps including: (*1*) the proper specification of what is wanted; (*2*) production to meet the full intent of the specification; (*3*) inspection to determine whether the resulting product or service is in accord with the specifications; and (*4*) review of usage to provide for revision of specification. **D 3614**

quality assurance—See **quality.**

quality control—See **quality.**

radiosonde, *n*—a miniature radio transmitter with instruments that is carried aloft (as by an unmanned balloon) for broadcasting by means of precise tone signals or other suitable method the humidity, temperature, pressure, or other parameter every few seconds.

range—See **analyzer.**

readout instrumentation—See **analyzer.**

relative humidity with respect to ice—See **humidity.**

relative humidity with respect to water—See **humidity.**

relative retention time (RRT)—See **retention time.**

retention time *(RT), n*—time to elute a specific chemical from a gas chromatographic column, for a specific carrier gas flow rate, measured from the time the chemical is injected into the gas stream to when it appears in the detector. **D 3687**

relative retention time (RRT), n—a ratio of RTs for two chemicals for the same chromatographic column and carrier gas flow rate, where the denominator represents a reference chemical. **D 3687**

repeatability, *n*—a measure of the precision of the analyzer to repeat its results on independent introductions of the same sample at different time intervals.

DISCUSSION—This is that difference between two such single instrument results, obtained during a stated time interval, that would be exceeded in the long run in only one case in twenty when the analyzer is operating normally. **D 3249**

reproducibility, *n*—a measure of the precision of different analyzers to repeat results on the same sample. **D 3249**

response time—See **analyzer.**

rise time—See **analyzer.**

rotameter, *n*—a device, based on the principle of Stoke's law, for measuring rate of fluid flow, consisting of a tapered vertical tube having a circular cross section, and containing a float that is free to move in a vertical path to a height dependent upon the rate of fluid flow upward through the tube.

ruggedness test, *n*—a factorial test designed to explore the sensitivity of the method to variations in the procedure (See Youden and Steiner, 1975). **D 3670**

running sample—See **sample.**

sample, *n*—a portion of a population intended to be representative of the whole.

cumulative sample, n—a sample obtained over a period of time with (*1*) the collected atmosphere being retained in a single vessel, or (*2*) with a separated component accumulating into a single whole.

DISCUSSION—Examples are dust sampling in which all the dust separated from the air is accumulated in one mass of fluid; the absorption of acid gas in an alkaline solution; and collection of air in a plastic bag or gasometer. Such a sample does not reflect variations in concentration during the period of sampling.

operating humidity range of sample, n—the range of ambient relative humidity of air which passes through the analyzer's sensing system, over which the monitor will meet all performance specifications. **D 3249**

operating temperature range of sample, n—the range of ambient temperatures of air, which passes through the analyzer's sensing system, over which the analyzer will meet all performance specifications. **D 3249**

personal sample, n—a sample representative of air-borne dust that is likely to enter the test subject's respiratory system and which is therefore taken by a collection apparatus (membrane filter) positioned near the nose and mouth of the subject or in the breathing zone. **D 4240**

running sample, n—withdrawal of a portion of the atmosphere over a period of time with continuous analysis or with separation of the desired material continuously and in a "linear" form.

DISCUSSION—Examples are continuous withdrawal of the atmosphere accompanied by absorption of a component in a flowing stream of absorbent or by filtration in a moving strip of paper. Such a sample may be obtained with a considerable concentration of the contaminant but it still indicates fluctuations in concentration which occur during the period of sampling.

sample system—See **analyzer.**

sampler, *n*—a device in which or through which atmospheric or emission samples are collected for analysis.

constant flow high-volume sampler, n—a sampler that is equipped with a constant flow device. **D 4096**

Hi-Vol (high-volume air sampler), n—a device for sampling large volumes of an atmosphere; collecting the contained particulate matter by filtration; and consisting of a high-capacity vacuum pump, a filter to collect suspended particles, and means for measuring or controlling the flow rate, or both. **D 4096**

sampling, *n*—a process consisting of the withdrawal or isolation of a fractional part of the whole.

DISCUSSION—In analysis of atmospheres or emissions, the separation of a portion of the analyte with or without the simultaneous isolation of selected compounds.

active sampling, n—a means of collecting an airborne or emission substance that employs a mechanical device such as a pump or vacuum-assisted critical orifice to draw air or emissions into or through the sampling device.

collocated sampling, n—the simultaneous collection of two or more air or emission samples by samplers placed side-by-side (often mistakenly termed *co-located* sampling), placed close enough to each other to ensure that comparable samples are collected, but separated sufficiently to prevent cross-interference.

condensation sampling, n—a process consisting of the collection of one or several components of a gaseous mixture by simple cooling of the gas stream in a device which retains the condensate.

continuous sampling, n—sampling without interruptions throughout an operation or for a predetermined time.

cryogenic sampling, n—the collection of an air or emission substance by condensation in a trap cooled to a temperature sufficient to condense or freeze the substance being collected, usually used in near real-time or sequential monitoring. Also called *freeze-trapping.*

event sampling, n—a special form of intermittent sampling where the duration of a sampling period is defined as a single, discrete occurrence of precipitation, dew, fog, or frost.

grab sampling, n—the collection of an atmospheric or emission substance without regard to variations, whether temporal or spatial.

instantaneous sampling, n—obtaining a sample of an atmosphere in a very short period of time such that this sampling time is insignificant in comparison with the duration of the operation or the period being studied.

intermittent sampling, n—sampling successively for limited periods of time throughout an operation or for a predetermined period of time.

DISCUSSION—The duration of sampling periods and of the intervals between are not necessarily regular and are not specified.

isokinetic sampling, n—sampling in which the linear velocity and direction of the fluid entering the sampling nozzle is equal to the undisturbed fluid stream at the sample point.

reactive sampling, n—the collection of an air or emission substance by reacting it with a chemical reagent (for example, derivatization).

sampling period(s), n—the record length or interval over which data collection occurs. **D 5527**

sampling rate (Hz), n—the rate at which data collection occurs, usually presented in samples per second (Hertz). **D 5527**

sampling train, n—the assemblage of equipment necessary to sample atmospheres.

sequential sampling—See **sample, running.**

source sampling, n—withdrawal, with or without simultaneous isolation of specific components, of a portion of the offgases from a source of pollutants.

DISCUSSION—Sometimes referred to as stack sampling when withdrawal is from a chimney, duct, or stack.

sampling period—See **sampling.**

sampling rate—See **sampling.**

sampling train—See **sampling.**

whole air sampling, *n*—the collection of an air sample into a sealable container such as a canister, bottle, or bag for subsequent analysis of its contents.

DISCUSSION—Whole air sampling can be instantaneous, integrative, or sequential.

sorbent sampling, n—the collection of chemicals from an air or emission sample by allowing the air or emissions to contact a sorbent.

saturation, *n*—the condition existing when a vapor is in equilibrium with the plane surface of a condensed phase of the same substance (liquid or solid). **D 4023**

saturation mixing ratio, n—the ratio of the mass of water vapor, m_v, to the mass of dry air, m_a, present in saturated air.

DISCUSSION—The saturation mixing ratio is designated by r_w when saturation is with respect to the plane surface of liquid water, and by r_i when saturation is with respect to the plane surface of ice.

D 4023

saturation vapor pressure, n—the vapor pressure of a system at a given temperature, wherein the vapor of the substance is in equilibrium with a plane surface of that substance's pure liquid or solid phase.

DISCUSSION—The saturation vapor pressure is an intrinsic property of that substance and is a function of temperature alone.

saturation vapor pressure of water, n—the pressure of water vapor in equilibrium with plane surface of a condensed phase.

DISCUSSION—When the condensed phase is liquid, the saturation vapor pressure is designated by e_w, and when the condensed phase is solid, the saturation vapor pressure is designated by e_i. The saturation vapor pressure is a function of temperature. **D 4023**

saturation mixing ratio—See **saturation.**

saturation vapor pressure of water—See **saturation.**

scrubber, *n*—a type of apparatus used in sampling and in gas cleaning in which the gas is passed through a space containing wetted packing or spray.

secondary standard—See **standard.**

secondary flow-rate standard—See **standard.**

semivolatile organic chemical—See **organic chemical.**

sensor, *n*—a device designed to respond to a physical stimulus (as temperature, illumination, and motion) and transmit a resulting signal for interpretation or measurement, or for operating a control.

sequential sampling—See *running sample* under **sample.**

series collection, *n*—an operation involving the use of two or more collectors joined in series.

settling velocity, *n*—the terminal rate of fall of a particle through a fluid as induced by gravity or other external force; the rate at which frictional drag balances the accelerating force (or the external force).

short-term exposure limit (STEL), *n*—the airborne concentration of a substance in a continuous 15-minute time period which should not be exceeded at any time during a workday.

DISCUSSION—See Threshold Limit Values for Chemical Substances and Physical Agents, American Conference of Governmental Industrial Hygienists, Cincinnati, OH 45240 and The Occupational Environment—Its Evaluation and Control, American Industrial Hygiene Assoc., Fairfax, VA 22031.

single-operator precision—See **precision.**

sling psychrometer—See **psychrometer.**

smog, *n*—a term derived from smoke and fog, applied to extensive atmospheric contamination by aerosols, these aerosols arising partly through natural processes and partly from the activities of human subjects.

DISCUSSION—Now sometimes used loosely for any contamination of the air.

smoke, *n*—small gas-borne particles resulting from incomplete combustion, consisting predominantly of carbon and other combustible material, and present in sufficient quantity to be observable independently of the presence of other solids.

snow, *n*—a solid form of wet deposition composed of white or translucent ice crystals chiefly in complex hexagonal form and often agglomerated into snowflakes. **D 5111**

sonic anemometer/thermometer, *n*—an instrument consisting of a transducer array containing paired sets of acoustic transmitters and receivers, a system clock, and microprocessor circuitry to measure intervals of time between transmission and reception of sound pulses.

DISCUSSION—The fundamental measurement unit is transit time. With transit time and a known acoustic pathlength, velocity or speed of sound, or both, can be calculated. Instrument output is a series of quasi-instantaneous velocity component readings along each axis or speed of sound, or both. The speed of sound and velocity components may be used to compute sonic temperature (T_s), to describe the mean wind field, or to compute fluxes, variances, and turbulence intensities. **D 5527**

sonic temperature—See **temperature.**

soot, *n*—agglomerations of particles of carbon impregnated with tar, formed in the incomplete combustion of carbonaceous material.

soot fall—See **particle fall.**

sorbent, *n*—a solid or liquid medium in or upon which materials are collected by absorption, adsorption, or chemisorption.

sorption, *n*—a process by which one material (the sorbent) takes up and retains another material (the sorbate) by the processes of absorption, adsorption, or chemisorption.

DISCUSSION—Chemical reactions may accompany or follow sorption.

Soxhlet apparatus, *n*—an apparatus for use in extracting organic or inorganic material with a suitable solvent in which the solvent is recirculated by evaporation and subsequent condensation.

source sampling—See **sampling.**

span drift—See **analyzer.**

specific gravity, *n*—the ratio of the density of the substance in question to the density of a reference substance at specified conditions of temperature and pressure.

specific humidity *(q), n*—the ratio of the mass of water vapor, m_v, to the total mass, $m_v + m_a$, of the moist air:

$$q = \frac{m_v}{m_v + m_a}$$

D 4023

spectrometry, *n*—an analytical technique for the quantitative or qualitative characterization of a sample, based on a comparison of the sample's spectrum with the spectrum of a known compound or with a standard(s) of known composition.

DISCUSSION—Examples of spectra used for analysis may include electromagnetic (X ray, ultraviolet, visible, infrared, or microwave) absorption or transmittance, emission, fluorescence, phosphorescence, and mass spectra.

spectrophotometry, *n*—a method for identification of substances and determination of their concentration by measuring light transmittance in different parts of the spectrum.

spirometer, *n*—a displacement gasometer consisting of an inverted bell resting upon or sealed by liquid (or other means) and capable of showing the amount of gas added to or withdrawn from the bell by the displacement (rise or fall) of the bell. **D 4096**

standard, *n*—an accepted reference sample or device used for establishing measurement of a physical quantity. **D 5011**

primary flow-rate standard, n—a device or means of measuring flow rate based on direct primary observations, such as time and physical dimensions. **D 4096**

primary standard, n—a standard directly defined and established by some authority, against which all secondary standards are compared. **D 5011**

secondary flow-rate standard, n—a flow-rate-measuring device, such as an orifice meter, that has been calibrated against a primary standard. **D 4096**

secondary standard, n—a standard used as a means of comparison, but checked against a primary standard. **D 5011**

transfer standard, n—a type of secondary standard.

DISCUSSION—It is a transportable device or apparatus which, together with operational procedures, is capable of reproducing pollutant concentration or producing acceptable assays of pollutant concentrations. **D 5011**

working flow-rate standard, n—a flow rate measuring device, such as an orifice meter, that has been calibrated against a secondary flow-rate standard.

DISCUSSION—The working flow-rate standard is used to calibrate a flow measuring or flow rate indicating instrument. **D 4096**

working standard, n—a standard used in the laboratory or field for periodic standardization of a measurement instrument. **D 4298**

standard air—See **air at normal conditions.**

standard gravity, *n*—as adopted by the International Committee on Weights and Measures, an acceleration of 9.80665 m/s^2. **D 3631**

standard impinger—See **impinger.**

starting threshold (U_0, m/s), *n*—the lowest wind speed at which a rotating anemometer starts and continues to turn and produce a measurable signal when mounted in its normal position.

DISCUSSION—The normal position for cup anemometers is with the axis of rotation vertical, and the normal position for propeller anemometers is with the axis of rotation aligned with the direction of flow. Note that if the anemometer axis is not aligned with the direction of flow, the calculated

wind speed component parallel to the anemometer axis is used to determine starting threshold. **D 5096**

static pressure—See **pressure.**

stoichiometric, *adj*—characterized by or being a proportion of substances or energy in a specific chemical reaction in which there is no excess of any reactant or product.

surface dust—See **dust.**

synthetic atmosphere—See **atmosphere.**

temperature—

absolute temperature, n—(*1*) temperature measured on the thermodynamic scale, designated as Kelvin (K). (*2*) temperature measured from absolute zero (−273.15°C or 459.67°F).

DISCUSSION—The numerical values are the same for both the Kelvin scale and the ideal gas scale.

dry-bulb temperature (t), n—the temperature of the ambient air, for example, the temperature that is measured by the dry-bulb thermometer of a psychrometer. **D 4023**

ice-bulb temperature (t_i), n—the temperature that a thermometer indicates when its bulb is surrounded by a thin film of ice (or a frozen moistened covering), and allowed to cool by sublimation of the ice into the surrounding air. **D 4023**

sonic temperature (T_s) (K), n—an equivalent temperature that accounts for the effects of temperature and moisture on acoustic wavefront propagation through the atmosphere.

DISCUSSION—Sonic temperature is related to the velocity of sound, c, absolute temperature, T, vapor pressure of water, e, and absolute pressure, P.

$$c^2 = 403\ T(1+0.32\ e/P) = 403\ T_s \quad (2)$$

D 5527

thermodynamic dew-point temperature (T_d), n—the temperature at which moist air with mixing ratio, r_w, and total pressure, p, when saturated with respect to water at the same pressure, p, will have a saturation mixing ratio, r_w, equal to the given mixing ratio, r. **D 4023**

thermodynamic frost-point temperature (T_f), n—the temperature at which moist air with mixing ratio, r, and total pressure, p, when saturated with respect to ice at the same pressure, p, will have a saturation mixing ratio, r_i, equal to the given mixing ratio, r. **D 4023**

thermodynamic ice-bulb temperature (T_i), n—the temperature that moist air at pressure, p, temperature, t, and mixing ratio, r, will attain when brought adiabatically to saturation at pressure, p, by sublimation of pure ice into the moist air.

DISCUSSION—The ice-bulb temperature, t_i, is approximately, but *not* identically, equal to the thermodynamic ice-bulb temperature, T_i. **D 4023**

thermodynamic wet-bulb temperature (T_w), n—the temperature that moist air at pressure, p, temperature, t, and mixing ratio, r, will attain when brought adiabatically to saturation at pressure, p, by the evaporation of pure liquid water into the moist air.

DISCUSSION—The wet-bulb temperature, t_v is approximately, but not identically, equal to the thermodynamic wet-bulb temperature T_w. **D 4023**

virtual temperature, n—the temperature, T_v, which dry air must have at the given barometric pressure, p, in order to have the same density as moist air at the same pressure, P, given temperature, T, and mixing ratio, r, provided that the dry and moist air behave in accordance with the perfect gas equation of state.

$$T_v = T\frac{(1+r/\epsilon)}{(1+r)}$$

where:

r = mixing ratio (mass of water vapor per mass of dry air, and

ϵ = ratio of the molecular weight of water vapor to that of dry air.

DISCUSSION—The virtual temperature is nearly equivalent to the sonic temperature, T_s:

$$T_s = T(1+0.32\ e/p)$$

$$T_v = T(1+0.38\ e/p)$$

where:

e = vapor temperature.

The virtual temperature increment $(T_v - T)$ defines the contribution of the water vapor to the static stability of the atmosphere. Thus, for two air parcels having the same absolute temperature, the one with the greater water vapor content will be less dense and then will tend to rise above the other parcel. Virtual temperature is also an important consideration for wave propagation through the atmosphere and for any process where atmospheric moisture content is relevant.

wet-bulb temperature (t_w), n—the temperature indicated by the wet-bulb thermometer of a psychrometer. **D 4023**

testing, *n*—the determination by technical means of properties; performance; or elements of materials, products, services, systems, or environments which involve application of established scientific principles and procedures. **D 3614**

the atmosphere—See **atmosphere.**
thermal precipitation—See **precipitation.**
thermodynamic dew-point temperature—See **temperature.**
thermodynamic frost-point temperature—See **temperature.**
thermodynamic frost-point temperature—See **temperature.**
thermodynamic wet-bulb temperature—See **temperature.**
total pressure—See **pressure.**
transfer standard—See **standard.**

threshold limit value (TLV), [4] *n*—threshold limit value-time weighted average (TLV-TWA) — the time-weighted average concentration for a conventional 8–h workday and 40–h workweek, to which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effect.

DISCUSSION—See 1999 TLVs and BEIs (American Conference of Governmental Industrial Hygienists, Cincinnati, OH, 1999) p 4.

transducer shadow correction, *n*—the ratio of the *true* along-axis velocity, as measured in a wind tunnel or by another accepted method, to the instrument along-axis wind measurement.

DISCUSSION—This ratio is used to compensate for effects of along-axis flow shadowing by the transducers and their supporting structure. **D 5527**

transfer function (U_f= a + bR, m/s)—the linear relationship between wind tunnel speed and the rate of rotation of the anemometer throughout the specified working range.

DISCUSSION—U_f is the wind tunnel speed in m/s, a is a constant, commonly called zero offset, in m/s, b is a constant representing the wind passage in m/r for each revolution of the particular anemometer cup wheel or propeller, and R is the rate of rotation in r/s. It should be noted that zero offset is not the same as starting threshold. In some very sensitive anemometers the constant a, zero offset, may not be significantly greater than zero. The constants a and b must be determined by wind tunnel measurement for each type of anemometer. **D 5096**

transit time (*t*, (s)), *n*—the time required for an acoustic wavefront to travel from the transducer of origin to the receiving transducer. **D 5527**

ultrasonic precipitation—See **precipitation.**

vapor, *n*—the gaseous phase of matter that normally exists in a liquid or solid state.

vapor concentration—See **concentration.**

vapor pressure of moist air (e), n—the product of the mole fraction of water vapor x_v and the total pressure p at temperature t:

$$e = p\,x_v$$

DISCUSSION—If the moist air is assumed to behave in accordance with the ideal gas laws, then the vapor pressure e is identically equal to the partial pressure of the water vapor in the moist air. **D 4023**

velocity pressure—See **pressure.**
virtual temperature—See **temperature.**
volatile organic chemical—See **organic chemical.**
volume concentration—See **concentration.**
volume density—See **concentration.**

week, *n*—(*1*) The week for workplace use is considered to be five workdays of approximately 8 h, within a period of seven consecutive days. (*2*) For reporting analysis of outdoor air on a weekly rate, results are calculated to a base of seven consecutive 24-h days.

wet-bulb depression ($t - t_w$), *n*—the difference between the dry-bulb temperature and the wet-bulb temperature. **D 4023**

wet-bulb temperature—See **temperature.**
wet deposition—See **deposition.**
wet impingement—See **impingement.**
whirling psychrometer—See **psychrometer, sling.**
working flow-rate standard—See **standard.**
working standard—See **standard.**
zero drift—See **analyzer.**

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[4] ~~Discontinued; see *1995 Annual Book*~~
[4] TLV is a registered tradename ~~of ASTM Standards, Vol 11.03.~~ the American Conference of Governmental Industrial Hygienists, Cincinnati, OH.