



**ENVIRONMENTAL HEALTH AND SAFETY  
LABORATORY SAFETY DESIGN GUIDE--  
APPENDIX B: DEFINITIONS**

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### XIII. APPENDIX B: DEFINITIONS

ABSL	Animal Biosafety Laboratory
ACGIH	American Conference of Governmental Industrial Hygienists
ACM	asbestos-containing materials
A/E	Architectural/Engineering design team
Aerosols	Colloids of liquid or solid particles suspended in gas.
SBC	Seattle Building Code
AIHA	American Industrial Hygiene Association
ALARA	As Low As Reasonably Achievable
AOP	Air Operating Permit
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc.
ASME	American Society of Mechanical Engineers
Biohazardous Materials	- Infectious agents, the products of infectious agents, or the components of infectious agents presenting a real or potential risk of injury or illness.
Biosafety Cabinet	- A ventilated cabinet, which serves as a primary containment device for operations involving biohazard materials. The three classes of biosafety cabinets are described below:  Class I Biosafety Cabinet - An open-fronted, negative-pressured, ventilated cabinet with a minimum inward face velocity at the work opening of at least seventy-five feet per minute. The exhaust air from the cabinet is filtered by a HEPA filter.  Class II Biosafety Cabinet - An open-fronted, ventilated cabinet. Exhaust air is filtered with a HEPA filter. This cabinet provides HEPA-filtered downward airflow within the workspace. Class II cabinets are further classified as type A, type B1, type B2, and type B3. <ul style="list-style-type: none"><li>➤ Class II, Type A Cabinets - May have positive-pressure contaminated internal ducts and may exhaust HEPA-filtered air back into the laboratory. 70% of the cabinet air is recirculated and 30% is exhausted.</li><li>➤ Class II, Type B1 Cabinets - Exhaust HEPA-filtered air through external ducts to space outside the laboratory, and have HEPA-</li></ul>

- filtered downflow air drawn in from the laboratory or outside air. 30% of the cabinet air is recirculated and 70% is externally vented.
- Class II, Type B2 Cabinets - Exhaust HEPA-filtered air through external ducts to space outside the laboratory, and have HEPA-filtered downflow air drawn in from the laboratory or outside air. 100% of the cabinet air is externally vented without recirculation.
  - Class II, Type B3 Cabinets - Have positive-pressure ducts or plenums surrounded by negative-pressure plenums, exhaust HEPA-filtered air through external ducts to space outside the laboratory, and have HEPA-filtered downflow air that is a portion of the mixed downflow air and inflow air from a common exhaust plenum. 70% of the cabinet air is recirculated and 30% is externally vented.

**Class III Biosafety Cabinet** - A totally enclosed, negative-pressure, ventilated cabinet of gas-tight construction. Operations within the Class III cabinet are conducted through protective gloves. Supply air is drawn into the cabinet through HEPA filters. Exhaust air is filtered by two HEPA filters placed in series or by HEPA filtration and incineration, and discharged to the outdoor environment without recirculation.

**Biosafety Level** - Biosafety levels consist of laboratory practices and techniques, safety equipment, a laboratory facility appropriate for the operations performed, and the hazard posed by the particular biohazard material. The Centers for Disease Control (CDC) and the National Institute of Health (NIH) define the four biosafety levels in the publication, "Biosafety in Microbiological and Biomedical Laboratories", and recommend biosafety levels for particular pathogenic microorganisms.

**Boiling Point** The temperature at which the vapor pressure of a liquid equals the surrounding atmospheric pressure. For purposes of defining the boiling point, atmospheric pressure shall be considered to be 14.7 psia\* (760 mmHg)

BSC	Biological safety cabinet
BSL	Biosafety Laboratory
BSO	Biosafety Officer
CDC	Centers for Disease Control
CFC	chloro-fluorocarbon
CFR	Code of Federal Regulations
cfm	cubic feet per minute

## Compressed Gas

1. A gas or mixture of gases having an absolute pressure exceeding forty psi at 70°F (21°C) in a container, or
2. A gas or mixture of gases having an absolute pressure exceeding 104 psi in a container at 130°F (54°C), regardless of the pressure at 70°F (21°C), or
3. both 1) and 2) or
4. A liquid having a vapor pressure exceeding forty psi at 100°F (38°C) as determined by UFC Standard No. 9-5.

CT Computerized Tomography

Containment The combination of personal practices, procedures, safety equipment, laboratory design, and engineering features to minimize the exposure of workers to hazardous or potentially hazardous agents.

Cryogenic Fluids("cryogens") - Elements and compounds that vaporize at temperatures well below room temperature. Most common cryogens have a normal boiling point well below approximately 120°K. Helium-4 (4.2°K), hydrogen (20°K), nitrogen (77°K), oxygen (90°K), and methane(112°K) [normal boiling point temperatures in parentheses] are examples of cryogens.

DCLU Department of Design, Construction, and Land Use

DDC Direct Digital Control

Decontamination - Removal or destruction of infectious agents; removal or neutralization of toxic agents.

DEXA Dual Energy X-Ray Absorption

DEA Drug Enforcement Administration

DHHS Department of Health and Human Services

DNA deoxyribonucleic acid

DOP dioctylphthalate

DOE United States Department of Energy

DOH State of Washington Department of Health, Division of Radiation Protection

EH&S Environmental Health and Safety

EPA Environmental Protection Agency

FDA Food and Drug Administration

Flammable or Combustible Liquids (definitions from NFPA 30, Chapter 1-7)

Flammable Liquid - Any liquid that has a closed-cup flash point below 100°F (37.8°C).

Class I Liquid - Any liquid that has a closed-cup flash point below 100°F (37.8°C) and a Reid vapor pressure not exceeding forty psia at 100°F (37.8°C).

Class IA Liquids - Includes those liquids that have flash points below 73°F (22.8°C) and boiling points below 100°F (37.8°C).

Class IB Liquids - Includes those liquids that have flash points below 73°F (22.8°C) and boiling points at or above 100°F (37.8°C).

Class IC Liquids - Includes those liquids that have flash points at or above 73°F (22.8°C) but below 100°F (37.8°C).

Combustible Liquid - Any liquid that has a closed-cup flash point at or above 100°F (37.8°C).

Class II Liquid - Any liquid that has a flash point at or above 100°F (37.8°C) and below 140°F (60°C).

Class IIIA Liquid - Any liquid that has a flash point at or above 140°F (60°C) but below 200°F (93°C).

Class IIIB Liquid - Any liquid that has a flash point at or above 200°F (93°C).

Flammable Anesthetic Gas

Compressed-gas, which is flammable and administered as an anesthetic cyclopropane, divinyl ether, ethyl chloride, ethyl ether and ethylene.

Flash Point: The minimum temperature of a liquid at which sufficient vapor is given off to form an ignitable mixture with air, near the surface of the liquid or within the vessel used.

fpm feet per minute

Fume Hood A device enclosed on three sides, as well as the top and bottom, with an adjustable sash or fixed partial enclosure on the remaining side. They are designed, constructed and maintained so as to draw air inward by means of mechanical ventilation, and so that any operation involving hazardous materials within the enclosure does not require the insertion of any portion of a person's body other than the hands and arms into the work area.

NOTE: Laboratory fume hoods prevent toxic, flammable, or noxious vapors from entering the laboratory, present a physical barrier from chemical reactions, and serve to contain accidental spills.

GFCI ground fault circuit interceptor

GFI ground fault interceptor

HCFC	hydro-chloro-fluorocarbon
HDR	high dose rate radiotherapy
HEPA	high-efficiency particulate air
HMIS	Hazardous Material Inventory Statement
HIV/HBV Research Facility	- A laboratory that produces or uses research-laboratory scale amounts of HIV or HBV but not in the volume found in production facilities.
HOA	Hand Off Auto
IAQ	Indoor Air Quality
IARC	International Agency of Research on Cancer
ICBO	International Council of Building Officials
ICNIRP	International Commission on Non-Ionizing Radiation Protection
JCAHO	Joint Commission on Accreditation of Health Care Organizations
kVp	kilovoltage peak
Laser Hazard Class	- The relative hazard of a given laser or laser system as specified in the ANSI Z136.1 Standard. Current laser classes are 1, 2, 3a, 3b, and 4. Generally, only Class 3b and 4 lasers present hazards sufficient to require specialty laboratory designs.
LC or LC50	lethal concentration
LD or LD50	lethal dose
LED	Light-emitting diode
lfm	linear feet per minute
LGAC	Laser-Generated Air Contaminant
Local Exhaust Ventilation	- Exhaust applied close to a source of air contaminants to prevent the migration of those contaminants into the breathing zones of people. It is often used to control exposures to hazardous chemicals when an apparatus is not appropriate for placement in a fume hood. These applications shall be evaluated by EH&S for exposure control and possible impacts on other ventilation systems.
LSO	Laser Safety Officer
Maximum Permissible Exposure (MPE)	- The level of any radiation to which a person may be exposed without hazardous effect or adverse biological changes in the organ(s) of concern. The MPE is normally expressed at a specific

energy/frequency /wavelength and defined exposure duration.

MeV million electron volts

Microwave Radiation - That portion of radio frequency energy consisting of radiation with frequencies between 300 GHz and 300 MHz.

NCRP National Council on Radiation Protection and Measurements

NFPA National Fire Protection Association

NIH National Institute of Health

NIOSH National Institute of Occupational Safety and Health

NIR Non-ionizing radiation

NMR nuclear magnetic resonance

NOC Notice of Construction

Non-Ionizing Radiation (NIR) - All electromagnetic radiation with photon energy less than 12.4 eV (>100 nm wavelength) and electric or magnetic fields. Examples are: lasers, nuclear magnetic resonance (NMR), microwave devices, radio-frequency devices, high-intensity ultra violet(UV) and infrared sources, and high-powered magnets. It is usually assumed that energy at frequencies below 300 MHz exists as discrete electric and magnetic fields rather than as electromagnetic radiation.

NSF National Sanitation Foundation

NTP National Toxicology Program

NUREG Nuclear Regulatory Commission Regulations

OEL occupational exposure limits

Operational Volumetric Flow Rate - The volumetric flow rate of supply air ventilation delivered to meet the minimum airflow requirements of a laboratory space for the comfort of the typical number of occupants plus sufficient volume to maintain negative pressurization of the space. The exhaust volumetric flow rate will be variable in laboratories equipped with variable air volume (VAV) hoods.

Optical Radiation - Any radiation with a wavelength between 100 nm and 1 mm. Lasers normally fall into this area.

OSHA United States Occupational Safety and Health Administration

PCB poly-chlorobenzodiazepene

PE Professional Engineer

PEL	Permissible Exposure Limit
PET	Positron Emission Tomography
PLC	programmable logic controllers
PMRDES	Project Manager's Reference Document for Environmental Stewardship
Power Frequency Field	- Any field with a frequency between 3 kHz and 1 Hz.
PPE	Personal Protection Equipment
Pressure Vessel	A storage tank vessel that has been designed to operate at pressures above fifteen psig.
RSC	Radiation Safety Committee
RSO	Radiation Safety Office, Radiation Safety Officer
Radio Frequency Energy (Radiation)	- Any energy with a frequency between 300 GHz and 30 kHz. For the purpose of interpreting standards, any energy with frequencies between 3 kHz and 300 GHz.
Safety Showers and Eyewashes:	
	Emergency Shower or Deluge Shower: A unit consisting of a shower head controlled by a stay-open valve that enables a user to have water cascading over the entire body.
	Eyewash: A device used to irrigate and flush the eyes.
	Combination Unit: An interconnected assembly of an eyewash and safety shower, supplied by a single plumbed source.
SBC	Seattle Building Code
SEPA	State Environmental Policy Act
SFC	Seattle Fire Code
SFD	Seattle Fire Department
SMC	Seattle Mechanical Code
Static Magnetic Fields	- Direct current (zero Hz) magnetic fields. Magnetic flux density (often called magnetic field strength) is expressed in A/m, Gauss(G), or Tesla(T). The units are related as $1 \text{ A/m} = 12.6 \text{ mG} = 1.26 \text{ nT}$ .
TA	Teaching Assistant
Tepid Water	Water which is moderately warm or lukewarm.

Threshold Limit Value/Ceiling(TLV-C) - The exposure limit that should not be exceeded, even for an instant.

Threshold Limit Value/Time-weighted Average (TLV-TWA) - The time weighted average exposure allowed for an eight-hour workday and forty-hour workweek.

TLV Threshold limit value

TLV/BEI Threshold limit value Biological Exposure Index

Toxic Material - Classes of toxicity include Acutely and Chronically Toxic. Included within the class of materials that exhibit chronic toxicity but still may present exceptional risk with a single exposure are carcinogens, mutagens, and teratogens.

Acutely Toxic Material - A material for which the lethal exposure levels fall within the ranges below:

Acute Toxicity Hazard Level					
Hazard Level	Toxicity Rating	Oral LD <sub>50</sub> (Rats, per kg)	Skin Contact LD <sub>50</sub> (Rabbits, per kg)	Inhalation LC <sub>50</sub> (Rats, ppm for 1 hr.)	Inhalation LC <sub>50</sub> (Rats, mg/m <sup>3</sup> for 1 hr.)
High	Highly toxic	< 50 mg	< 200 mg	< 200	< 2,000
Medium	Moderately toxic	50 - < 500 mg	200 mg - < 1g	200 - < 2,000	2,000 - < 20,000
Low	Slightly toxic	500 mg – 5 g	1 – 5 g	2,000 - 20,000	20,000 - 200,000

Toxic Material - A material which produces a lethal dose or a lethal concentration within any of the following categories:

A chemical or substance that has a median lethal dose (LD50) of more than fifty milligrams per kilogram but not more than five hundred milligrams per kilogram of body weight when administered orally to albino rats of between two hundred and three hundred grams each.

A chemical or substance that has a median lethal dose (LD50) of more than two hundred milligrams per kilogram but not more than one thousand milligrams per kilogram of body weight when administered by continuous contact for twenty-four hours, or less if death occurs within twenty-four hours, with the bare skin of albino rabbits of between two and three kilograms each.

A chemical substance that has a median lethal concentration (LC50) in air of more than two hundred parts per million but not more than two thousand parts per million by volume of gas or vapor; or, more than two milligrams per liter but not more than twenty milligrams per liter of mist, fume, or dust, when administered by continuous inhalation for one hour, or less if death occurs within one hour, to albino rats of two hundred and three hundred grams each.

Highly Toxic Material - Material which produces a lethal dose or lethal concentration which falls within any of the following categories:

A chemical that has a median lethal dose (LD50) of fifty milligrams or less per kilogram of body mass (mg/kg) when administered orally to albino rats of between two hundred and three hundred grams each.

A chemical that has a median LD50 of 200 mg/kg or less when administered by continuous contact for twenty-four hours, or less if death occurs within twenty-four hours, with the bare skin of albino rabbits of between two and three kilograms each.

A chemical that has a median lethal concentration (LC50) in air of two hundred parts per million by volume or less of gas or vapor, or 2 milligrams per liter or less of mist, fume or dust, when administered by continuous inhalation for one hour, or less if death occurs within one hour, to albino rats between two hundred and three hundred grams each.

NOTE: Mixtures of these materials with ordinary materials, such as water, may result in the classification of "highly toxic" not being warranted. While this system is basically simple in application, experienced, technically competent persons shall perform any hazard evaluation, which is required for the precise categorization of this type of material.

- Carcinogen: A hazard that can cause cancer. Substances and exposures which have been adequately proven to be carcinogens are defined as select carcinogens in the UW Laboratory Safety Manual, May 2000, Select Carcinogen, Appendix H, with examples listed.

Or, if you want an excessively detailed definition....

- Carcinogen (UW Laboratory Safety Manual, May 2000, Select Carcinogen): A hazard that can cause cancer, considered a carcinogen if:

It is regulated by WISHA as a carcinogen;

OR

It is listed as "known to be carcinogens" in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition);

OR

It is listed as "carcinogenic to humans" by the International Agency for Research on Cancer (IARC) Monographs (latest edition);

OR

It is listed in either Group 2A ("Probably carcinogenic to humans") or 2B ("Possibly carcinogenic to humans") by IARC or in the category of "Reasonably anticipated to be human carcinogens" by NTP, and it causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:

After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m<sup>3</sup>;

or

After repeated skin application of less than 300 mg/kg of body weight per week;

or

After oral dosages of less than 50 mg/kg of body weight per day.

- Mutagens and Teratogens: A mutagen is a substance or hazard that may cause heritable damage to reproductive cells which can result in a mutation. A teratogen is a substance or hazard that may cause damage to a developing embryo or fetus. "Workplace Hazards to Reproduction and Development," Sharon L. Drozdowsky and Stephen G. Whittaker, Technical Report Number 21-3-1999, August 1999, Washington Department of Labor and Industries (L&I), Safety and Health Assessment & Research for Prevention (SHARP) Program contains listings of known and suspect mutagens and teratogens.

UFC Uniform Fire Code

UL Underwriters Laboratory

USDA United States Department of Agriculture

Vapor Pressure - The pressure, often measured in psia, exerted by a liquid.

VAV Variable air volume

VFD Variable frequency drive

WAC Washington Administrative Code

WSBC Washington State Building Code