

# *Glossary*

Absorbed Dose	The energy imparted to matter by ionizing radiation per unit mass of irradiated material at the place of interest. The SI unit is the gray (Gy); 1 Gy = 1 Joule/Kg, or 100 rads. The conventional unit of absorbed dose is the rad; 1 rad = 100 ergs/g. See also Dose, Absorbed.
Activated Metal	A metal that has been made radioactive through the process of activation. For the purpose of the University of Colorado, an activated metal is considered a sealed source and is usually a small metal disc. See also Activation.
Activation	The process of making a radionuclide by bombarding a stable element with neutrons, protons, or other nuclear radiation.
Activity	Time rate of nuclear transformations. The conventional unit of activity is the curie, Ci and the SI unit of activity is the Becquerel, Bq. See also Radioactivity and Decay, Radioactive.
ALARA	Acronym for "As Low As Reasonably Achievable." An approach to radiation protection which has the objective of attaining individual and collective doses as far below regulatory limits as is reasonably achievable. ALARA considers the state of technology, the economics of improvements in relation to the state of technology and benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and radioactive materials in the public interest.
Alpha Particle	A positively charged particle ejected spontaneously from the nuclei of some radioactive elements. Identical to a helium nucleus having a mass number of 4 and an electrostatic charge of +2, it has low penetrating power and a short range. The most energetic alpha particle generally fails to penetrate the dead layers of cells covering the skin. Alphas are hazardous when an alpha-emitting radionuclide is inside the body.
Analytical X-ray	An x-ray producing device used to determine elemental composition, or to examine the microstructure of materials using diffraction or fluorescence analysis. See also Medical X-ray and X-ray.
Annual Limit on Intake (ALI)	The derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. An ALI is the smaller value of intake of a given radionuclide in a year by the reference man that would result in a committed effective dose equivalent of 0.05 Sv (5 rem) or a committed dose equivalent of 0.5 Sv (50 rem) to any individual organ or tissue.
Area Survey	A survey using a portable radiation survey meter to determine the dose rate in a given area. Most radiation survey meters have scales of mR/hr or counts per minute (cpm). See also Contamination Survey.
Atom	The smallest particle of an element that cannot be divided or broken up by chemical means. It consists of a central core of protons and neutrons, called the nucleus. Electrons revolve in orbits in the region surrounding the nucleus.

Atomic Number	The number of positively charged protons in the nucleus of an atom.
Attenuation	The process by which the number of particles or photons entering a body of matter is reduced by absorption and scatter.
Audit, Laboratory	See Laboratory Audit.
Authorized User	An individual who uses radioactive materials and/or radiation unsupervised, or supervises their use and is issued a University of Colorado Radioactive Materials License. See also Principal Investigator and Licensee.
Background Radiation	Radiation from cosmic sources; naturally occurring radioactive materials, including radon and global fallout as it exists in the environment from the testing of nuclear explosive devices. It does not include radiation from source material, byproduct material, or special nuclear materials. The typically quoted average individual exposure from background radiation is 360 millirem per year.
Becquerel (Bq)	The unit of radioactive decay equal to 1 disintegration per second. $3.7 \times 10^{10}$ Bq = 1 Curie.
Beta Particle	A charged particle emitted from a nucleus during radioactive decay, with a mass equal to 1/1837 that of a proton. A negatively charged beta particle is identical to an electron. A positively charged beta particle is called a positron. Large amounts of beta radiation may cause skin burns, and beta emitters are harmful if they enter the body. Beta particles may be stopped by thin sheets of plastic, wood, or metal.
BIER VII	The National Research Council's committee on the Biological Effects of Ionizing Radiations (BIER). Committee VII published a report in 2006 titled <i>Health Risks From Radiation</i> which suggested levels of risk associated with radiation exposure.
Bioassay	The determination of kinds, quantities or concentrations, and in some cases, the locations of radioactive material in the human body, whether by direct measurement ( <i>in vivo</i> ) or by analysis and evaluation of materials excreted or removed from the human body ( <i>in vitro</i> ).
Biohazardous Waste	For the purposes of this handbook, biologically active waste material that has not been rendered non-infectious using bleach or other disinfectant. Reminder - Autoclaves are NOT PERMITTED for use with radioactive materials.
Biological Half-life	The time required for a biological system, such as that of a human, to eliminate, by natural processes, half of the amount of a substance (such as a radioactive material) that has entered it.
Calibration	The act or process of tuning an instrument by determining the deviation from a standard to ascertain the proper correction factors. Refers to radiation survey meters for the purposes of this handbook. Radiation survey meters are calibrated at least annually by Health Physics.
CDPHE	Acronym for the "Colorado Department of Public Health and Environment" which establishes and enforces the regulations relating to radiation and radioactive materials in the State of Colorado.

Container Contents Sheet	A sheet of paper near or attached to a waste container which describes the waste material inside the container. Each sheet must be completed properly for the container to be collected for disposal.
Contamination	The deposition of unwanted radioactive material on the surfaces of structures, areas, objects, or personnel. It may also be airborne or internal (inside components or personnel).
Contamination Survey	A survey using a wipe smear and liquid scintillation counter (LSC) or gamma counter to determine the radioactive contamination in a given area. Most LSCs and gamma counters provide results in counts per minute (cpm) which are converted to decays per minute (dpm) using the efficiency of the instrument. See also Area Survey.
Cosmic Radiation	Penetrating ionizing radiation, both particulate and electromagnetic, originating in outer space. Secondary cosmic rays, formed by interactions in the earth's atmosphere, account for approximately 0.45 to 0.5 mSv (45 to 50 mrem) of the 3.6 mSv (360 mrem) background radiation that an average individual receives in a year.
Curie (Ci)	The conventional unit used to describe the intensity of radioactivity in a sample of material. The curie is equal to 37 billion disintegrations per second, which is approximately the rate of decay of 1 gram of radium. A curie is also a quantity of any radionuclide that decays at a rate of 37 billion disintegrations per second or 37 billion Becquerels. Named for Marie and Pierre Curie, who discovered radium in 1898.
Decay, Radioactive	The decrease in the amount of any radioactive material with the passage of time, due to the spontaneous emission from the atomic nuclei of either alpha or beta particles, often accompanied by gamma radiation. See also Activity and Radioactivity.
Declared Pregnant Woman	A woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception. For the purposes of this handbook, informing the employer means informing Health Physics.
Decontamination	The reduction or removal of contaminating radioactive material from a structure, area, object, or person.
Dose	The absorbed dose, given in grays (Gy) or rads, that represents the energy absorbed from the radiation in a gram of any material. Furthermore, the biological dose or dose equivalent, given in sieverts (Sv) or rem, is a measure of the biological damage to living tissue from the radiation exposure.
Dose, Absorbed	The amount of energy deposited in any substance by ionizing radiation per unit mass of the substance. It is expressed numerically in grays (Gy) or rads. See also Absorbed Dose.
Dose Equivalent	A term used to express the amount of biologically effective radiation dose when modifying factors have been considered. The product of absorbed dose multiplied by a quality factor multiplied by a distribution factor. It is expressed numerically in sieverts (Sv) or rems. If the dose is in Gray (Gy), the dose equivalent is in sieverts (Sv). If the dose is in rads, the dose equivalent is in rems.

Dose Limit	A limitation on the legal amount of dose allowed during a given period, usually one year. The values are established in regulations and enforced by CDPHE. Dose limits vary depending upon the classification of the individual of concern; for example, a radiation worker, a member of the public, a minor, or an embryo/fetus.
Dosimeter	A portable instrument for measuring and registering the total accumulated dose to ionizing radiation.
Dosimetry	The theory and application of the principles and techniques involved in the measurement and recording of radiation doses.
Dose Rate	The radiation dose delivered per unit time, e.g. rem per hour or mrem per hour. In practice, it may also be expressed as mR/hr. New meters also reflect SI units of Sieverts per hour (Sv/hr) or millisieverts per hour (mSv/hr).
Effective Dose Equivalent	The sum over the tissues of the product of the dose equivalent in a tissue, the weighting factor representing its proportion of the risk resulting from irradiation of tissue to the total risk when the whole body is irradiated uniformly.
Effective Half-life	The time required for the amount of a radioactive element deposited in a living organism to be diminished 50% as a result of the combined action of radioactive decay and biological elimination.
Electron	An elementary particle with a negative charge and a mass equal to 1/1837 of the proton. Electrons surround the positively charged nucleus and determine the chemical properties of the atom.
Element	One of the 103+ known chemical substances that cannot be broken down further without changing its chemical properties. Some examples include: Hydrogen, Nitrogen, Gold, Lead, and Uranium.
Emergency Responder	For the purposes of this handbook, anyone responding to an emergency involving radioactive materials. These individuals may include EH&S, Police, and Fire personnel.
Environmental Monitoring	Monitoring conducted to evaluate radioactive material and/or radiation released to the environment to ensure compliance with applicable regulations. Monitoring may include area dosimetry, air samples, and water samples.
Equipment Survey	A contamination survey conducted to ensure that an instrument or piece of equipment is not contaminated prior to transfer and/or disposal.
Exposure	Being exposed to radiation or to radioactive material. Also that amount of $\gamma$ or x-radiation that produces one electrostatic unit of charge in air at standard temperature and pressure. This concept applies only to electromagnetic radiation in air.
External Radiation	Exposure to ionizing radiation when the radiation source is located outside the body.

Extremity Dosimeter	An instrument used to measure and register the accumulated dose received by an extremity. Generally associated with radionuclides emitting high energy beta particles or gamma rays. See also Dosimeter, Fetal Dosimeter, Ring Badge, and Whole Body Dosimeter.
Extremity (-ies)	The hands, forearms, elbows, feet, knee, leg below the knee, and ankles. Permissible radiation exposures in these regions are generally greater than the whole body because they contain less blood forming organs and have smaller volumes for energy absorption.
Fetal Dosimeter	An instrument used to measure and register the accumulated dose received by an embryo/fetus. See also Declared Pregnant Woman, Dosimeter and Whole Body Dosimeter.
Freezer Frost	The frost created in a freezer that can be potentially contaminated with radioactive materials, especially tritium (H-3).
Gamma Ray	High-energy, short wavelength, electromagnetic radiation emitted from the nucleus. Gamma radiation frequently accompanies alpha and beta emissions and always accompanies fission. Gamma rays are very penetrating and are best stopped or shielded by dense materials, such as lead or uranium. Gamma rays are similar to X-rays.
Geiger-Mueller Counter	A radiation detection and measuring instrument. It consists of a gas-filled tube containing electrodes, between which there is an electrical voltage, but no current flowing. When incoming radiation ionizes the gas in the tube, a short, intense pulse of current passes from the negative electrode (cathode) to the positive electrode (anode) causing an electrical pulse which is measured or counted by the meter. The number of pulses per second measures the intensity of the radiation field. It was named for Hans Geiger and W. Mueller, who invented it in the 1920's. It is sometimes simply called a Geiger counter or a GM Counter.
Generator	For the purposes of this handbook, anyone who handles or produces hazardous waste.
Generator Cabinet	A protective cabinet surrounding each x-ray generator which limits leakage radiation measured at a distance of 5 centimeters from its surface such that it is not capable of producing a dose in excess of 0.25 mrem (2.5 $\mu$ Sv) in one hour.
Genetic Effects	Those effects of radiation that may be transmitted to the progeny of exposed individuals.
Gray (Gy)	The System International (SI) unit of absorbed radiation dose equal to 1 Joule per Kilogram. 1 Gy = 100 rad.
Half-life	The time in which one half of the atoms of a particular radioactive substance disintegrates into another nuclear form. Measured half-lives vary from millionths of a second to billions of years. Also called physical or radiological half-life.
Half-life, Biological	The time required for the body to eliminate one half of the material taken in by natural biological means.

Half-life, Effective	The time required for a radionuclide contained in a biological system, such as a human or an animal, to reduce its activity by one half as a combined result of radioactive decay and biological elimination.
Half-life Categories	The categories used by Health Physics to separate wastes for decay-in-storage prior to disposal. There are three categories, identified by the colors yellow, orange and green, representing the half-lives less than 60 days, between 60 and 90 days, and greater than 90 days.
Health Physics	The science concerned with recognition, evaluation, and control of health hazards from ionizing radiation. The group in Environmental Health and Safety that is responsible for Radiation Safety.
High Radiation Area	Any area with dose rates greater than 1 mSv (100 mrem) in one hour at 30 cm from the source or from any surface through which the radiation penetrates. These areas must be posted as "high radiation area" and access into these areas is maintained under strict control.
Hot	A colloquial term meaning highly radioactive.
Hot Spot	The region in a radiation / contamination area in which the level of radiation / contamination is noticeably greater than in neighboring regions in the area.
Interlock	For the purposes of this Handbook, a safety device used to prevent an operator from inadvertently placing any portion of their body in the direct beam of an x-ray device.
Internal Radiation	Nuclear radiation resulting from radioactive substances in the body. Some examples are Iodine-131 (found in the thyroid gland) and Strontium-90 and Plutonium-239 (found in bone).
Inventory	See Radioactive Materials Inventory.
Inverse Square Law	A result of geometry, this law shows that the radiation intensity is inversely proportional to the square of the distance from the source. Therefore, if the distance is increased from 1 meter to 2 meters, the intensity will be only one fourth of the original intensity, $1/2^2$ .
Ionization	The process of adding one or more electrons to, or removing one or more electrons from, atoms or molecules, thereby creating ions. High temperatures, electrical discharges, or nuclear radiations can cause ionization.
Ionizing Radiation	Any radiation capable of displacing electrons from atoms or molecules, thereby producing ions. Some examples are alpha, beta, gamma, X-ray, neutrons, and ultraviolet light. High doses of ionizing radiation may produce severe skin or tissue damage.
Isotope	One of two or more atoms with the same number of protons, but different numbers of neutrons in their nuclei. Thus Carbon-12, Carbon-13, and Carbon-14 are isotopes of the element carbon, the numbers denoting the approximate atomic weights. Isotopes have very nearly the same chemical properties, but often different physical properties. For example, Carbon-12 and Carbon-13 are stable, but Carbon-14 is radioactive.

Label	A sticker, sign, tape, or posting which provides identification or description.
Laboratory Audit	An audit of a laboratory's procedures and use of radioactive materials under the University of Colorado Radioactive Materials License issued to a Principal Investigator. Usually conducted at least annually and usually unannounced.
Laboratory Contact	An individual designated on the University of Colorado Radioactive Materials License who is the liaison between the laboratory and the Health Physics staff. This person usually receives mailings, exchanges dosimeters, and handles waste pick-up requests.
Leak Test	A wipe smear test similar to a contamination survey which verifies the integrity of a sealed source. If the results of the survey indicate more than 185 Bq (0.005 $\mu$ Ci) of contamination, the sealed source is considered leaking, taken out of use, and either repaired or disposed of promptly.
License	A document authorizing a Principal Investigator to use radioactive materials and/or radiation for specific purposes in specific locations. Officially referred to as the University of Colorado Radioactive Materials License. See also Authorized User, Licensee, and Principal Investigator.
Licensee	An individual who uses radioactive materials and/or radiation unsupervised, or supervises their use and is issued a University of Colorado Radioactive Materials License. See also Authorized User and Principal Investigator.
Licensing	The review process and paperwork necessary to obtain a University of Colorado Radioactive Materials License.
Liquid Scintillation Counter (LSC)	Instrument used to measure radiation and/or contamination levels by utilizing a liquid solution which fluoresces, or emits light, when interacting with radioactive material. LSCs are primarily used in association with beta emitters; however, they can also detect some alpha particles and most gamma emitting radiation.
Medical X-ray Device	A device used to irradiate human beings for the purpose of diagnosis or treatment. See also Analytical X-ray and X-ray.
Microcurie	One millionth of a Curie. Abbreviated $\mu$ Ci.
Milli-	Prefix indicating one thousandth of a unit.
sievert	One thousandth of a Sievert. Abbreviated mSv.
gray	One thousandth of a Gray. Abbreviated mGy.
curie	One thousandth of a Curie. Abbreviated mCi.
rad	One thousandth of a rad. Abbreviated mrad.
rem	One thousandth of a rem. Abbreviated mrem.
roentgen	One thousandth of a Roentgen. Abbreviated mR.
Mixed Waste	Waste that has both radioactive and chemical constituents. This waste must comply with regulations governing both hazards.

Natural Uranium	Uranium as found in nature. It contains 0.7% Uranium-235, 99.3 % of Uranium-238, and a trace of Uranium-234.
Neutron	An uncharged elementary particle with a mass slightly greater than a proton, and found in the nucleus of every atom heavier than hydrogen.
Non-Ionizing Radiation	Radiation not having enough energy to ionize atomic or molecular systems with a single event. Characterized by frequencies below the far ultraviolet region of the electromagnetic spectrum and includes ultraviolet (UV), visible light, infrared (IR), microwave, and other radio-frequency (RF) radiation. It is also found in the acoustic spectrum and includes sonic and ultrasonic radiation.
Nucleus	The small, central, positively charged region of an atom that carries essentially all of the mass. Except for the nucleus of ordinary hydrogen, which has a single proton, all atomic nuclei contain both protons and neutrons. The number of protons determines the total positive charge, or atomic number. This is the same for all the atomic nuclei of a given chemical element. The total number of neutrons and protons is called the mass number.
Nuclide	A general term referring to all known isotopes, both stable (279) and unstable (about 5,000), of the chemical elements.
Over Exposure	An exposure to radiation which leads to a dose in excess of the regulatory limits.
Pancake Probe	A thin paddle-like probe used to detect high energy alpha, beta and gamma radiation. See also Geiger-Mueller Counter.
Personnel Monitoring	The use of survey meters to determine the amount of radioactive contamination on an individual, or the use of dosimetry to determine an individual's radiation dose.
Photon	A quantum (or packet) of energy emitted in the form of electromagnetic radiation. Gamma rays and X-rays are examples of photons.
Pick-up Request	See Radioactive Waste Pick-up Request Form.
Pig	A container (usually lead or plastic) used to ship or store radioactive materials. The thick walls protect the person handling the container from radiation. Large containers are commonly called casks. (The word may have originated from the use of "pig iron" in the early days of handling radioactive materials.)
Plated Source	Generally considered a sealed source for the purposes of this handbook. A source which has radioactive material bound to its surface by electroplating. The material cannot be removed from the surface under normal conditions.
Port	An opening on an x-ray device which allows the primary beam to pass out of the device to irradiate an object of interest. Sometimes used to mount a camera or other analytical device.
Positron	Particle equal in mass, but opposite in charge, to the electron (a positive electron).

Principal Investigator	An individual who uses radioactive materials and/or radiation unsupervised, or supervises their use and is issued a University of Colorado Radioactive Materials License. See also Authorized User and Licensee.
Procurement Card	The University's Master Card obtained through the Procurement Services Center. Reminder – the Procurement Card <u>CANNOT</u> be used for purchasing radioactive materials.
Proton	An elementary nuclear particle with a positive electric charge located in the nucleus of an atom.
Purchase Request	A form used to request a purchase and designate a shipping address. Normally available in each department, these forms are approved by Health Physics for purchasing radioactive materials and radiation producing machines. If used without a Standing Purchase Order, they must be signed by Health Physics.
Quality Factor	The factor by which the absorbed dose (e.g., ergs/g or rad) is to be multiplied to obtain a quantity that expresses, on a common scale for all ionizing radiation, the biological damage (e.g., Sievert or rem) to exposed persons. It is used because some types of radiation, such as alpha particles, are more biologically damaging than other types.
Rad	Acronym for Radiation Absorbed Dose, the basic unit of absorbed dose of radiation. A dose of one rad means the absorption of 100 ergs (a small but measurable amount of energy) per gram of absorbing tissue. 100 rad = 1 Gray.
Radiation, Nuclear	Particles (alpha, beta, neutrons) or photons (gamma) emitted from the nucleus of an unstable radioactive atom as a result of radioactive decay.
Radiation Area	Any area with radiation levels greater than 0.05 mSv (5 mrem) in one hour at 30 cm from the source or from any surface through which the radiation penetrates.
Radiation Producing Machines	Machines designed to produce radiation, usually x-rays, when operating.
Radiation Safety Committee (RSC)	The on-site regulatory Committee for the University's Radioactive Materials License. This committee has the authority to establish policies and procedures, provide enforcement sanctions, and restrict the use of radioactive materials and/or radiation. The RSC issues, amends, and terminates laboratory licenses, which authorize the specific activities associated with radioactive materials and/or radiation. It is composed of faculty and staff members representing various departments and levels of experience with radioactive materials and radiation, as well as a representative from Administration.
Radiation Safety Handbook	A user's guide for the University of Colorado's laboratory licensees that includes topics such as the safe use of radioactive materials and radiation, licensing, and waste disposal. This document becomes regulation through the Radiation Safety Committee (RSC) and the State of Colorado. Amendments are reviewed and approved by the RSC.

Radiation Safety Officer	An individual approved by the State of Colorado who has the knowledge, responsibility, and authority to apply appropriate radiation protection regulations. The University of Colorado must have a Radiation Safety Officer (RSO) in order to have its Radioactive Materials License.
Radiation Safety Survey Log	A logbook of contamination survey results for each laboratory. This log may also contain room diagrams and results of area surveys. It should be kept in a central location for review during laboratory audits and inspections by Federal, State, or local agencies.
Radiation Safety Training	The basic radiation safety courses offered by Health Physics to fulfill the training requirements of the University's License for users of unsealed isotope, sealed sources, and radiation-producing machines.
Radiation Shielding	Reduction of radiation by interposing a shield of absorbing material between any radioactive source and a person, work area, or radiation-sensitive device.
Radiation Source	Usually a manmade sealed source of radiation used in various types of instruments and industrial gauges. Machines such as accelerators and natural radionuclides may be considered sources.
Radiation Source Housing	The material surrounding the x-ray tube that restricts physical proximity and radiation released from the radiation producing machine.
Radiation Standards	Exposure standards, permissible concentrations, rules for safe handling, regulations for transportation, regulations for industrial control of radiation, and control of radioactive material by legislative means.
Radiation Warning Symbol	An officially prescribed symbol (a magenta or black trefoil) on a yellow background that must be displayed where certain quantities of radioactive materials are present or where certain doses of radiation could be received.
Radioactive	Exhibiting radioactivity or pertaining to radioactivity.
Radioactive Materials	Any solid, liquid, or gas which emits radiation spontaneously. Sometimes abbreviated as RAM.
Radioactive Materials Inventory	A list of radionuclides in a laboratory. The inventory includes the date of receipt, an unique identification number, the radionuclide, and the activity. Reminder – laboratories should keep this list updated at all times. Health Physics updates each laboratory's inventory on a quarterly basis.
Radioactive Waste Pick-Up Request	A form used to request a radioactive waste pick-up. It summarizes for each container, the container type(s), volume, radionuclide(s), total activity, constituents, pH, and location. This form is used to properly manifest the waste for transportation and to ensure appropriate replacement containers are issued.

Radioactive Waste	Unwanted radioactive material or items that are contaminated with radioactive material.
Radioactivity	The spontaneous emission of radiation, generally alpha or beta particles, often accompanied by gamma rays, from the nucleus of an unstable atom. See also Activity and Decay, Radioactive.
Radioisotope	An unstable form of an element that decays or disintegrates spontaneously, emitting radiation. Approximately 5000 natural and artificial radioisotopes have been identified. See also radionuclide.
Radionuclide	An unstable form of an element that decays or disintegrates spontaneously, emitting radiation. Approximately 5000 natural and artificial radioisotopes have been identified. See also radioisotope.
Radiosensitivity	The relative susceptibility of cells, tissues, organs, organisms, or other substances to the injurious action of radiation.
Relative Risk	The ratio of risk from radiation in an irradiated population to the risk in a comparable non-irradiated population.
Rem	The special unit of dose equivalent. The dose equivalent equals the absorbed dose multiplied by the quality factor. 100 Rem = 1 Sievert (Sv).
Restricted Materials (Waste)	Items that should be segregated from each other and include sharps, lead pigs, liquids, solids, and scintillation vials.
Ring Badge	See Extremity Dosimeter.
Roentgen	An unit of exposure to ionizing radiation. It is the amount of gamma or X-rays required to produce ions resulting in a charge of 0.00258 coulombs/kilogram of air under standard conditions. Named after Wilhelm Roentgen, German scientist who discovered X-rays in 1895.
Safety Devices	When used in conjunction with radioactive material or x-ray devices, these may be interlocks, physical barriers, or other engineering controls.
Scattered Radiation	Radiation that, during its passage through a substance, has been changed in direction. It may also have been modified by a decrease in energy. It is one form of secondary radiation.
Sealed Source	Radioactive material that is permanently bonded or fixed in a capsule or matrix designed to prevent release and dispersal of the radioactive material under the most severe conditions which are likely to be encountered in normal use and handling.
Sealed Source Inventory	A list of sealed sources in a laboratory. The inventory includes the date of receipt, a unique identification number, the radionuclide, and the activity.
Sealed Source Sign-out Log	A record of source use including the date when it is removed from storage, the date it is returned to storage, and the location in which it is being used. Generally found on or near the storage location.

Secondary Radiation	Radiation originating as the result of absorption of other radiation in matter. It may be either electromagnetic or particulate in nature.
Shielding	Any material or obstruction that absorbs radiation and thus tends to protect personnel or materials from the effects of ionizing radiation.
Shutter	An automatic closure device on x-ray machines that cannot be opened unless a collimator or coupling has been connected to the port.
Sievert (Sv)	The System International (SI) unit of dose equivalent equal to 1 Joule per Kilogram. 1 Sv = 100 rem.
Spill	An unintentional release or spread of radioactive materials.
Standing Purchase Order	A form/system used to request multiple purchases from the same supplier. Normally available in each department, these forms are approved by Health Physics for purchasing radioactive materials and radiation producing machines for a period of one year. They are established through the Procurement Service Center (PSC).
Storage Cabinet	A cabinet used to hold radioactive materials not in use in a laboratory. Generally used for sealed sources of radioactive material.
Storage Freezer	A freezer used to hold radioactive materials not in use in a laboratory. Generally used for unsealed radioactive sources.
Storage Refrigerator	A refrigerator used to hold radioactive materials not in use in a laboratory. Generally used for unsealed radioactive sources.
Support Staff	University of Colorado staff members and others involved in service functions in relation to administration of laboratories using radioactive materials. Custodians and facilities management trades people are examples of support staff.
Survey	A study to find the radiation or contamination level of specific objects or locations within an area of interest, or to locate regions of higher-than-average intensity, i.e., hot spots.
Survey Meter	Any portable radiation detection instrument adapted for inspecting an area to establish the existence and amount of radioactive material.
Terrestrial Radiation	The portion of natural radiation (background) that is emitted by naturally occurring radioactive materials in the earth.
Thermoluminescent Dosimeter (TLD)	A device used to measure radiation by evaluating the amount of visible light emitted from a crystal in the detector after being exposed to radiation. See also Extremity Dosimeter.
Thin-end Window Probe	A small cylinder-like probe used to detect high energy beta and gamma radiation. See also Geiger-Mueller Counter.
Tritium	A radioactive isotope of hydrogen ( $^3\text{H}$ , one proton, two neutrons). Because it is chemically identical to natural hydrogen, tritium can be taken into the body by any ingestion path. It decays by beta emission. It has a radioactive half-life of about 12.5 years.

Unstable Isotope	A radioisotope.
Unsealed Radionuclide	Radioactive materials which do not meet the definition of sealed sources. Generally, these are in liquid form in laboratories.
Uranium (U)	A radioactive element with the atomic number 92 and as found in natural ores, an atomic weight of approximately 238. The two principle natural isotopes are U-235 (0.7% of natural Uranium) and U-238 (99.3% of natural Uranium). See also Natural Uranium.
Urinalysis	An analysis and evaluation of urine used to determine kinds, quantities or concentrations, and in some cases, the locations of radioactive material in the human body. A form of bioassay used for individuals working with large amounts of tritium.
Very High Radiation Area	An area in which radiation levels exceed 5 Gy (500 rads) in one hour at 1 meter from the source or from any surface that the radiation penetrates.
Warning Device(s)	Lights, sounds, signs, or barriers which indicate an existing hazard.
Waste, Radioactive	Materials from radioactive materials operations that are radioactive or become radioactive and for which there is no further use. Wastes are generally classified as high, low, or intermediate levels based on activity per gallon or per cubic foot. The University generates low level radioactive waste.
Waste Container	For the purposes of this handbook, containers used to hold waste items. These are color coded for half-life categories and are specific to the type of waste generated. See also Container Contents Sheet and Radioactive Waste Pick-up Request Form.
Whole-Body	For the purposes of external dose; head, trunk including male gonads, arms above the elbow, or legs above the knee.
Whole-Body Dosimeter	An instrument used to measure and register the accumulated dose received by the whole body. See also Dosimeter and Extremity Dosimeter.
Whole-Body Exposure	An exposure of the body to radiation, in which the entire body, rather than an isolated part, is irradiated. Where a radioisotope is uniformly distributed throughout the body tissues, rather than being concentrated in certain parts, the result can be considered as whole-body exposure.
Wipe Sample (a.k.a. Wipe Smear, Swipe, etc.)	A sample made to determine the presence of removable radioactive contamination on a surface. It is done by wiping, with slight pressure, a piece of soft filter paper over a representative type of surface area, usually 100 cm <sup>2</sup> .
X-ray	Penetrating electromagnetic radiation (photon) having a wavelength that is much shorter than that of visible light. These rays are usually produced by excitation of the electron field around certain nuclei. In nuclear reactions, it is customary to refer to photons originating in the nucleus as gamma rays, and to those originating in the electron field of the atom as X-rays. See also Analytical X-ray and Medical X-ray.