LAB SAFETY PART 2- CHEMICAL HYGIENE PLAN

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CHEMICAL HYGIENE PLAN

Contact List

In the event of a life threatening emergency dial 9- 911 for the emergency operator and contact Drexel security.

Main Campus	(215) 895-2222
Center City	(215) 762-7110 Emergency Operator – dial 80
Queen Lane	(215) 991-8102 Emergency Operator – dial 80
MCP	(215) 842-6633 Emergency Operator – dial 80
EPPI	(215) 842-4180 Emergency Operator – dial 80
Drexel Security:	(215) 895-2222 (Chemical spills, Emergencies) (215) 895-2822 (General Information)

In the event of a life threatening emergency dial 9- 911 for the emergency operator and contact Drexel security.

Safety and Health:

Jonathan Chase, (Executive Director)
(215) 895-5891 (Office)
(215) 669-6122 (Mobile)
(215) 518-8371 (Mobile)

Armour Floyd, (Director)
(215) 895-5908 (Office)
(215) 768-1617 (Mobile)

Martin Bell, (Chemical Hygiene Officer)
(215) 895-5892 (Office)
(215) 778-4278 (Mobile)

Phillip Leo, (Hazardous Materials Manager)
(215) 895-5909 (Office)
(215) 768-1624 (Mobile)

Tanya Fraser, (Industrial Hygienist)
(215) 762-7624 (Office)
(215) 768-1623 (Mobile)

Diana Dukes, (Safety Coordinator)
(215) 895-5907 (Office)
(215) 778-4279 (Mobile)

Louise Hollins, Secretary
(215) 762-3719 (Office)
Fax: (215) 762-7899 (Office)

In the event of a life threatening emergency dial 9- 911 for the emergency operator and contact Drexel security.

Chemtrec: (800) 424-9300

In the event of a life threatening emergency dial 9- 911 for the emergency operator and contact Drexel security.

Main Campus	(215) 895-2808 (Emergencies) Fixit@drexel.edu (Non emergency work orders)
Center City	(215) 762-6500
Queen Lane	(215) 991-8484
MCP	(215) 991-8484
EPPI	(215) 991-8484

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Foreword/Disclaimer

The Occupational Safety and Health Administration (OSHA) promulgated a final rule on January 31, 1990 for occupational exposure to hazardous chemicals in laboratories (The Lab Standard - 29CFR1910.1450). The basis for this standard is that laboratories typically differ from industrial operations in their use and handling of hazardous chemicals and that a different approach from the Hazard Communication Standard of 1987 is warranted.

The final OSHA standard, commonly known as the "Chemical Hygiene Plan for Laboratories," applies to all laboratories that use hazardous chemicals in accordance with the definition of laboratory use and laboratory scale as provided in the OSHA standard.

The effective date of the OSHA standard is May 1, 1990 and all Chemical Hygiene Plans (CHP) are required to be in place by January 31, 1991 in accordance with 29 CFR Part 1910.1450 of the *Federal Register*.

In compliance therewith, Drexel University has developed a Chemical Hygiene Plan, as described herein, and made effective this date.

Drexel University reserves the right to change, amend, add or delete any part or the whole of this plan at any time. Although the information in this plan is compiled from sources believed to be reliable, its accuracy is not guaranteed, nor is any responsibility assumed or implied for any damage or loss resulting from inaccuracies or omissions.

Any questions pertaining to the contents of this plan should be discussed with persons indicated in the Plan.

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A. Formal Policy Statement

Drexel University is committed to providing a safe working environment and believes employees have a right to know about health hazards associated with their work. This Chemical Hygiene Plan introduces policies, procedures and responsibilities designed to develop in employees an awareness of potentially hazardous chemicals in the work place as well as the need to maintain appropriate and safe working areas and conditions. It is designed to assist employees in making knowledgeable decisions about any personal risks associated with employment at this institution.

Every Drexel student and employee is responsible for following the safety rules of Drexel University by reading and understanding the regulations and procedures contained within this document. All students and employees will have access to pertinent safety information through their supervisor who should be the first individual to contact for information or problems. In this regard, the following procedure should be followed:

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A-1. Teaching Laboratories

1. Discuss the problem with your Teaching Assistant.
2. If not satisfied, discuss the problem with the Faculty member in charge of the laboratory.
3. If still not satisfied and the problem is that of:
    a. a chemical or physical hazard (other than radiation or laser) discuss the problem with the University Safety Officer, who is also the Chemical Hygiene Officer.
    b. a radiation or laser hazard discuss the problem with the Radiation Safety Officer.
    c. a biological hazard discuss the problem with the University Biosafety Officer.
4. If still unsatisfied, request a meeting with the appropriate Safety Officer, the Faculty Member/Laboratory Supervisor and your Department Head.
5. If still not satisfied, request for a meeting with the Dean of the College.
6. If still not satisfied, request for a meeting with the University Provost.

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A-2. Research Laboratories

1. Discuss the problem with your immediate supervisor.
2. If you are not satisfied, then discuss the problem with the Principal Investigator
3. If still not satisfied and the problem is that of:
    a. a chemical or physical hazard (other than radiation or laser) discuss the problem with the University Safety Officer, who is also the Chemical Hygiene Officer.
    b. a radiation or laser hazard discuss the problem with the Radiation Safety Officer.
    c. a biological hazard discuss the problem with the University Biosafety Officer.
4. If still unsatisfied, request a meeting with the appropriate Safety Officer, the Principal Investigator and your Department Chair.
5. If still not satisfied, request for a meeting with the Associate Vice President for Research Compliance

Drexel conducts an orientation program for new employees whether part time or temporary about the hazards of the work place and procedures to follow to avoid accidents. Additional site-specific training is available and may be necessary to fully educate employees on the hazards associated with different work practices, protocols and procedures. These training events may be presented by any of the appropriate University Safety Officers, the PI or the Department Head. In any event, however, training activities must be properly documented and copies of all syllabi and sign-in sheets must be sent to the University Safety Office. For the purposes of this CHP, the term "supervisor" applies to that individual with the authority to assign, direct and review the work of one or more subordinates. This definition applies to laboratory, office or department heads and may, in some instances, apply to certain individuals who have supervisory functions under a laboratory, office or department head.

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B. MSDS Glossary

B. MSDS GLOSSARY

The following is a list of acronyms, terms, and definitions associated with the Material Safety Data Sheet of the Chemical Hygiene Plan.

Absorption	--	The process by which a substance can be readily taken into a body. For example, some chemicals can be absorbed through unbroken skin.
Acid	--	A compound consisting of hydrogen plus one or more other elements and which, in the presence of some solvents or water, reacts to release ions. Acids have the ability to turn litmus paper red and to neutralize bases.
Acute	--	Severe, usually critical, often dangerous conditions in which relatively rapid changes occur as a result of exposure to high concentrations of material over a short period of time. Acute effects are easier to reverse than are the effects of chronic exposure. See "chronic."
Alkali	--	A compound which has the ability to neutralize an acid and form a salt. Alkalis turn litmus paper blue. See "base and pH."
Aliphatic	--	Pertains to an open-chain carbon compound that is usually applied to petroleum products derived from paraffin base, has a straight or branched chain, and has a saturated or unsaturated molecular structure. Examples: hexane, naphtha, and

mineral spirits.

Analgesia -- Loss of sensitivity to pain.

Anaphylaxis -- Hypersensitivity resulting from sensitization following prior contact with a chemical or protein.

Anesthesia -- Loss of sensation or feeling.

Anhydrous -- Does not contain water.

Anosmia -- Loss of the sense of smell.

Anorexia -- Loss of appetite.

Aqueous -- A water-based solution.

Argyna -- Local or generalized impregnation (gray-blue color) of the body tissues with silver.

Aromatic -- Fragrant or of marked odor. Applied to a group of hydrocarbons and their derivatives characterized by the presence of one or more six-carbon rings. Examples are: benzene, toluene, xylene.

Asphyxia -- Unconsciousness due to interference with the oxygen of the blood.

Asphyxiation -- A condition that causes asphyxia, suffocation.

Asthma -- A disease characterized by recurring attacks of dyspnea, wheezing, and cough, due to spasmodic contraction of the
bronchioles.

Ataxia -- A loss of power of muscular coordination.

Auto-Ignition Temperature-- the lowest temperature at which a flammable-gas or vapor-air mixture will ignite from its own heat source or a contacted heated surface without the presence of a spark or flame.

Barrier Cream -- A cream for use on human skin to protect against injury from contact with specific types of harmful agents.

Base -- A compound which reacts with an acid to form a salt. It turns litmus paper blue.

Biohazard -- This is a combination of the words biological hazard and is used to describe infectious agents presenting a risk or potential risk to the well-being of man or animals either directly through infection, or indirectly through disruption of the environment.

Biological Half-Life -- The time required for a given species, organ, or tissue to eliminate half of a substance which it takes in

Normal Boiling Point -- The temperature at which a substance will boil. This is the point at which the vapor pressure of a liquid is equal to atmospheric pressure.

Bradycardia -- A slow heartbeat in which the pulse rate falls below 60.

Breathing Zone -- The area of the ambient environment in which a person breathes.

Bronchitis -- Inflammation of the bronchial tubes in the lungs.

Buffer -- Substance that reduces the change in hydrogen ion concentration in a solution, which otherwise would result from adding acids or bases.

Carcinogen -- Any substance which, under certain quantified exposures, produces cancer in animals or humans. A chemical is considered to be a carcinogen if: (a) it has been evaluated by the International Agency for Research on Cancer (IARC) and found to be a carcinogen or potential carcinogen; or (b) it is listed as a carcinogen or potential carcinogen in the annual report on carcinogens published by the National Toxicology Program (NTP); or (c) it is regulated by OSHA as a carcinogen.

Ceiling Limit -- A concentration that is not to be exceeded.

Carcinogenic -- Cancer-producing.

Carcinoma -- A malignant tumor or cancer; a new growth made up of epithelial cells, tending to infiltrate and give rise to metastasis.

Catalyst -- A substance which, without changing its composition, causes a chemical reaction to occur.

Cataract -- A loss of transparency of the crystalline lens of the eye or of its capsule.

Caustic -- Something which strongly irritates, burns or destroys living tissue.

Chemical -- Any element, compound or mixture of elements and/or compounds.

Chemical Name -- The scientific designation of a chemical in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Service (CAS) rules of nomenclature, or a name which would clearly identify the chemical for the purpose of conducting a hazard *evaluation.*

Chemical Compound -- A substance composed of definite proportions by weight of two or more elements, and whose properties differ from those of its elements. Also see "mixture."

Chemical Family -- A group of individual elements or compounds with a common general name. Example: acetone, methyl ethyl ketone (MEK).

Chloracne -- An acne-like eruption from contact with chlorinated naphthalenes and polyphenyls acting on sweat glands.

Chronic -- Persistent, prolonged, and/or repeated effects, which are the result of repeated exposure to low concentrations of a chemical substance over a long period of time. See "acute. "

Chronic Effect -- An adverse effect on a human or an animal with

symptoms that develop slowly over an extended period of time or that recurs frequently.

Chronic Toxicity -- An adverse effect resulting from repeated doses or exposure to a substance over a relatively prolonged period of time. The term is usually used to denote effects in experimental animals.

Combustible Liquid -- Any liquid with a flashpoint at or above 100° F. Combustible liquids are divided into two classes as follows: Class II liquids include those with flashpoints at or above 100° F and below 140° F, except any liquid having components with flashpoints of 200° F or higher, the volume of which make up 99% or more of the total volume of the mixture.

Class III liquids include those with flashpoints at or above 140° F. Class III liquids are divided into two subclasses: Class III liquids include those with flashpoints at or above 140° F and below 200° F, except any mixture having components with flashpoints of 200° F, or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

Class IIIB liquids include those with flashpoints at or above 200° F.

Compressed Gas -- A gas under pressure of at least 40 pounds per square inch (psi) and some liquids with very high vapor pressure, i.e., pressure that exceeds 40 psi. Examples are argon, helium, and nitrogen.

Concentration -- The amount of a substance uniformly dispersed in a given amount of fluid.

Conjunctivitis -- Inflammation of the conjunctiva, the delicate membrane that lines the eyelids and covers the eyeballs.

Contact Dermatitis -- Caused by contact with a primary irritant, a skin irritation at the area of skin contact.

Cornea -- Transparent structure of the external layer of the eyeball.

Corrosive -- Any material, liquid or solid, that causes visible destruction of, or irreversible alterations in human skin tissues at the site of contact (burns). See also Caustic

Cutaneous Hazards -- Chemicals which irritate the skin.

Cyanosis -- Blueness of the skin, generally caused by lack of oxygen.

Dermal -- Pertaining to the skin.

Dermal Toxicity -- Adverse effects resulting from exposure of the skin to a substance; ordinarily used to denote effects in experimental animals.

Dermatitis -- Inflammation of the skin. There are two types of skin reaction: primary irritation dermatitis and sensitization dermatitis. Also see irritant, sensitizer, and contact dermatitis.

Dose -- The term used to express the amount of energy or substance absorbed in a unit volume of an organ or individual. Dose rate is the dose delivered per unit of time.

Dysfunction -- Any abnormality or impairment of an organ.

Dyspnea -- Labored or difficult breathing; shortness of breath.

Eczema -- A skin disease or disorder; one specific type of dermatitis.

Edema -- An abnormal accumulation of clear, watery fluid in the tissues; swelling.

Element -- A substance composed entirely of one kind of atom. Elements are designated by chemical symbols.

Emphysema -- A lung disease in which the presence of air in the connective tissues of the lungs causes swelling or inflammation.

Epistaxis -- Nosebleed; hemorrhage from the nose.

Evaporation Rate -- The inverse of the time it takes a given amount of material to completely vaporize (evaporate) when compared to an equal amount of reference material.

Flammable Aerosol -- An aerosol that yields a flame projection longer than 18 inches of full valve opening or a flashback (a flame extending back to the valve) at any valve opening.

Flammable Gas -- A gas that will burn or explode if combined with air over a wide concentration range. Examples are acetylene, hydrogen, and propane.

Flammable Liquid -- A liquid that has a flashpoint below 100° F (38 C) and can be ignited by a spark without any pre-heating. Examples are acetone, toluene, and methanol.

Flammable Solid -- A solid, other than a blasting agent or explosive, that is ignited easily and burns intensely without any other fuel being needed. Ignition can occur through friction, absorption of moisture, spontaneous chemical change, or retained from manufacturing or processing. Examples are aluminum and titanium powders.

Flammable (Explosive)-- Indicates the explosive or flammable range of a vapor or gas. Those concentrations of a vapor or gas in air below or above which flame does not occur on contact with a source of ignition. The-lower explosive limit (LEL) is the minimum concentration below which the vapor-air mixture is too lean to burn or explode. The upper explosive limit (UEL) is the maximum concentration above which the vapor-air mixture is too rich to burn or explode. LEL and UEL are given in terms of percentage by volume of gas or vapor in air.

Limits - LEL & UEL

Concentration is referred to as too lean to explode	Explosive or flammable range	Concentration is referred to as too rich to explode
100% air LEL	UEL	100% air

Flash point -- The lowest temperature at which liquid produces enough vapors to form an ignitable mixture with the air.

Fume Fever -- An acute condition caused by a brief high exposure to the freshly generated fumes of

metals, such as lead or magnesium, or their oxides.

Gastroenteritis	--	Inflammation of the stomach and intestines.
Hazardous Material	--	A material that is characterized by one or more of the following: (1) has a flashpoint below 140° F, closed cup, or is subject to spontaneous heating; (2) has a threshold limit value below 500 ppm for gases and vapors, below 500 mg/m3 for fumes, and below 25 mppcf for dusts; (3) single oral dose LD50 or below 50 mg/kg of body weight; (4) is subject to polymerization which results in the release of large amounts of energy; (5) is a strong oxidizing or reducing agent; (6) causes first degree burns to skin in short time exposure, or is systematically toxic on contact with the skin; and/or (7) in the course of normal operations may produce smoke, dusts, gases, fumes, vapors, or mists which have one or more of the above characteristics.
Health Hazard	--	Anything (including certain chemicals) that, according to at least one scientific study, may be harmful to the health. Chemicals classified as health hazards include those that are carcinogens; toxic or highly toxic agents; reproductive toxins; irritants; corrosives; sensitizers; hepatotoxins; neurotoxins; agents that act on the hematopoietic system; or agents which damage the lungs, skin, eyes, or mucous membranes.
Hematologic Disturbances	--	Blood disturbance
Hematuria	--	The presence of blood in the urine.
Hepatotoxin	--	A chemical which produces liver damage.
Hydrocarbons	--	Composed solely of carbon and hydrogen.
Hygroscopic	--	Readily absorbs moisture form the air.
Hypoxia	--	Insufficient oxygen especially as applied to body cells.
Immiscible	--	Liquids which will not mix with each other but will form two separate layers or will result in cloudiness or turbidity.
Incompatible	--	Materials that cause dangerous reactions when in contact with one another.
Infectious Agent	--	Source that causes infections either by inhalation, ingestion, or direct contact with the host material.
Inflammation	--	A morbid series of reactions produced in the tissues by an irritant; it is marked by an afflux of blood with exudation of plasma and leukocytes.
Ingestion	--	The taking in of a substance through the mouth; eating it.
Inhalation	--	The act of breathing in. This is the most common route of entry for chemicals.
Inhibitor	--	An agent that arrests or slows chemical action.
Injection	--	The entry of chemicals into the body by means of broken skin from sores, cuts, burns, or scratches.
Insoluble	--	A substance that is incapable of being dissolved.

Irodocyditis	--	Inflammation of both the iris and ciliary body of the eye.
Irritant	--	A chemical that is not corrosive, but that causes a reversible inflammatory effect on living tissue by chemical action at the site of contact. Also see dermatitis and sensitizer
Ketosis	--	The condition marked by excessive production of ketone bodies in the body.
Laboratory Scale	--	Work with the substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safely manipulated by one person.
Laboratory Use	--	Handling or use of such chemicals in which all the following conditions are met: (1) Chemical manipulations are carried out on a "laboratory scale"; (2) Multiple chemical procedures or chemicals are used; (3) The procedures involved. are not part of the production process, nor in any way simulate a production process; and (4) "Protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.
Latent Period	--	The period of time between exposure and the first manifestation of the damage.
Lead Intoxication	--	Lead absorption resulting from inhalation of lead dust or fumes, or from swallowing lead dust.
LEL	--	Lower explosive limit. See flammable (explosive) limits.
Lesion	--	Injury, damage, or abnormal change to body tissue or organs.
Lethal Concentration(LC)	--	A concentration of a substance that is sufficient to kill a test animal.
Lethal Concentration 50	--	LC50 - See toxic inhalation LD50.
Metastasis	--	Transfer of a disease producing agency from the site of disease to another part of the body; a secondary metastatic growth of a malignant tumor.
Metabolism	--	The chemical changes whereby the body functions.
Mixture	--	A combination of two or more substances, which may be separated by mechanical means.
Mutagen	--	A chemical that causes a defect in sperm or egg cells prior to conception.
Narcosis	--	Stupor or unconsciousness produced by some narcotic agent.
Nausea	--	Tendency to vomit, feeling of sickness of the stomach.
Necrosis	--	Local death of tissue.
Nephrotoxins	--	Chemicals that primarily affect the nervous system.
Nystagmus	--	Spasmic, involuntary motion of the eyeballs, in either a horizontal, vertical, or circular pattern.

Olfactory	--	Pertaining to the sense of smell.
Oliguria	--	Scanty or low volume of urine.
Opaque	--	Impervious to light.
Oral	--	Through the mouth.
Oral Toxicity	--	Adverse effects resulting from taking a substance into the body via the mouth. Ordinarily used to denote the effects in experimental animals.
Organic Peroxides	--	Organic compounds that are highly reactive; some are unstable and may act as an explosive or oxidizer.
Oxidizer	--	A material, other than a blasting agent or an explosive that contains oxygen and may start or assist combustion in other materials. Examples are chromic acid, concentrated nitric acid, and potassium permanganate.
Oxidizing Agent	--	A material that releases oxygen atoms or accepts electrons during a chemical reaction.
Permissible Exposure Limit--**(PEL)**		An exposure limit established by OSHA regulatory authority. See threshold limit value (TLV).
Personal Protective Equipment (PPE)	--	Devices worn by the worker to protect against hazards in the environment. Respirators, gloves, and ear protectors are examples.
pH	--	A measure used to quantify the level of acidity or alkalinity. Strong acids have-a pH near 1, strong bases near 13, and a pH of 7 indicate neutrality.
Pneumoconiosis	--	Dusty lungs resulting from the continued inhalation of various kinds of dust and other particles.
Polymerization	--	A chemical reaction in which many small molecules combine covalently to form a larger one.
Protective Laboratory Practices and Equipment	--	Those laboratory procedures, practices, and equipment accepted by the laboratory health and safety experts as effective, or that the employer can show to be effective, in minimizing the potential for employee exposure to hazardous chemicals
Pulmonary Agents	--	Chemicals that may damage the lungs.
Pulmonary Edema	--	The condition of having fluid in the lungs.
Pyrophoric	--	A chemical that will ignite spontaneously and burn when exposed to air at temperatures below 130° F.
Reactivity	--	The ability of a material to undergo a chemical reaction.
Reducing Agent	--	A material which accepts oxygen atoms or gives up electrons in a reaction.

Reproductive Toxins -- Chemicals which have a negative effect on the reproductive capabilities, including chromosomal damage (mutations) and birth defects to the fetus (teratogenesis).

Respirator -- A device designed to protect the wearer from the inhalation of contaminated air

Respiratory Disease -- Any disease that affects the lungs or the respiratory tract.

Respiratory Irritants -- Any chemical that produces a reversible inflammatory effect on the respiratory system.

Safety Can -- An OSHA-approved dosed container which has thefollowing characteristics: (1) a capacity of not more than 5 gallons (19 liters); (Z) a spring-closing lid and spout cover; (3) flash-arresting screen; and (4) designed to safely relieve internal pressure if exposed to fire.

Saturation -- The maximum concentration of matter that can be dissolved in a solution at a given temperature.

Sensitization -- An allergic reaction that increases in severity with subsequent exposures. A person previously exposed to a certain material is more sensitive when further contactwith this material is encountered.

Sensitizer -- Chemicals that my cause an allergic reaction after one or more exposure. Once an individual becomes sensitized, a small dose of the material may cause a big effect. See dermatitis and irritant.

Skin Notation -- A chemical that can penetrate unbroken skin.

Soluble -- Capable of being dissolved.

Solubility -- The ability of a material to dissolve in water or other solvent.

Solubility in Water -- The percentage of a material (by weight) that will dissolve in water at ambient temperature. Terms used to express solubility are:

negligible	less than 0.1%
slight	0.1 to 1.0%
moderate	1 to 10%
appreciable	more than 10%
complete	soluble in any proportion

Spasm -- An involuntary, convulsive, muscular contraction.

Specific Gravity -- A measurement used to quantify the weight of a substance by comparing the weight of a given volume of material to the same volume of water. Material with a specific gravity greater than 1 is heavier than water and will sink if it does not dissolve. Material with a specific gravity of less than one will float on the water if it does not dissolve. See solubility in water.

Spontaneous Combustion-- Combustion resulting from a chemical reaction with the slow generation of heat from oxidation of organic compounds until the ignition temperature of the material (fuel) is reached. The condition is reached only where there is sufficient air from oxidation but not enough ventilation to carry away the heat as fast as it is generated.

Stability -- The tendency of a material to resist undesirable chemical changes during storage or transportation.

Stupor -- Partial or nearly complete unconsciousness.

Synergistic -- Pertaining to the action of two or more substances, organs or organisms to achieve an effect of which each is individually incapable.

Systemic -- Spread throughout the body and affecting all systems and organs; not localized in one spot or area.

Tachycardia -- Excessively rapid heartbeat.

Target Organ -- Primary organ in body attacked by a chemical.

Teratogens -- Chemicals that cause birth defects in a developing fetus.

Thermal Decomposition -- The breakdown of a material when heated.

Threshold Limit Value (TLV) The Threshold Limit Value (TLV) is a safe exposure level set by the American Conference of Governmental Industrial Hygienists (ACGIH). A Permissible Exposure Limit (PEL) is a similar level set by OSHA. Both refer to airborne concentrations of substances and represent an exposure level under which most people can work constantly for 8 hours a day, day after day, with no harmful effects. Three categories of TLVs are specified: (1) Time Weighted Average (TLV-TWA) - This is the time weighted average concentration for a normal 8-hour workday or 40-hour work week, to which all workers may normally be exposed day after day, without adverse effect; (2) Short Term Exposure Limit (TLV-STEL) - This is the maximum concentration to which workers can be exposed for a period of up to 15 minutes continuously without suffering from (a) irritation, (b) chronic or irreversible tissue change, or c) narcosis of sufficient degree to impair self-rescue or reduce work efficiency. No more than four 15-minute exposure periods per day are permitted with at least 60 minutes between those periods; (3) Ceiling (TLVC) - The concentration that should not be exceeded even instantaneously.

NOTE: If any of the above TLVs is exceeded, a potential hazard from that substance is presumed to exist.

Tinnitus -- A ringing or singing sound in the ears.

Toxemia -- Poisoning by way of the bloodstream.

Toxic -- The toxicity chemicals can be measured using a variety of animal studies. OSHA uses three categories for this: (1) Oral LD50 - Lethal dose 50% test: the medium lethal dose that kills 50% of the albino white rats that received it. Oral LD50 is expressed as milligrams of chemical per kilogram of test animal body weight. A dose of one milligram per kilogram (mg/kg) is equal to 1 one millionth of the test animal's body weight. OSHA considers a chemical to be toxic if the Oral LD50 is between 60 mg/kg and 500 mg/kg; (2) Skin LD50 - A dose that kills 50% of the albino white rabbits that had the chemical applied directly to the bare skin for 24 hours. Skin LD50 is also expressed in mg/kg. OSHA considers a chemical to be toxic if the skin LD50 is between 200 mg/kg and 1000 mg/kg; (3) Inhalation LC50 - Lethal concentration 50%: the concentration of a chemical in the air needed to kill 50% of the albino white rats

		that breathed it. LD50 is expressed as parts per million (ppm) for bases and vapors. LD50 is also expressed as milligrams per liter (mg/l) for mists, fumes, and dust. See highly toxic.
Toxicity	--	The degree of injury or illness caused by a toxic material.
Unstable (Reactive)	--	A chemical which in pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shock, pressure, or temperature.
UEL-Upper Explosive Limit		See flammable explosive limits.
Urticaria	--	Nettle-rash; hives; elevated itching, white patches.
Vapor Density	--	A measure of how heavy a vapor is compared to air, which has a vapor density of one. Vapors more dense than air accumulate close to the floor and in low spaces.
Vapor Pressure	--	A measure of how readily a material will evaporate and indicates how volatile a liquid is. The lower the vapor pressure, the slower it evaporates and the longer it takes to build up toxic or explosive concentrations.
Vertigo	--	A feeling of revolving in space; dizziness, giddiness.
Viscosity	--	Resistance to flow exhibited by a fluid.
Volatility	--	The tendency or ability of a liquid to vaporize.
Volatile Organic Compound (VOC)	--	An organic compound that evaporates.
Volatile Percent	--	The fraction by weight or volume of a chemical that evaporates in a mixture.
Water Reactive	--	A chemical that reacts with water.

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C. MSDS Abbreviations and Symbols

C. MSDS Abbreviations and Symbols

ABIH	American Board of Industrial Hygiene
ACGIH	American Conference of Governmental Industrial Hygienists
ACS	American Chemical Society
AIHA	American Industrial Hygiene Association
AMA	American Medical Association
ANSI	American National Standards Institute
AQTX	Aquatic Toxicity
ASTM	American Society for Testing and Materials
atm	atmosphere
BLS	Bureau of Labor Statistics
ca	(circa) about
CAR	Carcinogenic effects

CAS	Chemical Abstract Service
cc	cubic centimeter
XXXX	Closed Cup
(C)	Ceiling concentration
CFM	Cubic Feet per Minute
CFR	Code of Federal Regulations
CNS	Central Nervous System
COC	Cleveland Open Cup
conc	concentration
decomp	decompose or decomposition
DHHS	U.S. Department of Health and Human Services
DOL	U.S. Department of Labor of which the Occupational Safety and Health Administration (OSHA) is a part
DOT	Department of Transportation
EPA	Environmental Protection Agency
FR	Federal Register
G.I. or GI	Gastrointestinal
g or gm	gram
IARC	International Agency for Research on Cancer
inhl	inhalation
insol	insoluble
IRDS	Primary irritation dose
IRR	Irritation effects (systemic)
kg	kilogram (one thousand grams)
L	Liter
LC50	Lethal concentration to 50% of those tested (mean lethal concentration)
LDLo	Lowest possible lethal dose
LEL	Lower Explosive Limit
LFM	Linear Feet per Minute
m3	cubic meter
mg	milligram (1/1000, 10-3, of a gram)
gm/m3	milligrams of substance per cubic meter of air
ml	milliliter
mm Hg	millimeters of Mercury
MLD	Mild
mppcf	millions of particles per cubic foot of air
MSDS	Material Safety Data Sheet(s)
MLV	Molecular Weight
n-	normal
NBS	National Bureau of Standards
NCI	National Cancer
NEO	Neoplastic effects
NFPA	National Fire Protection Agency
NIOSH	National of Occupational Safety and Health
NOx	Oxides of Nitrogen
NTIS	National Technical Information Services
ng	nanogram (one-billionth, 10-9, of a gram)
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit (OSHA)
pH	Negative logarithm of the hydrogen ion concentration
PMCC	Pensky-Martens Closed Cup
ppb	parts per billion
PPE	Personal Protective Equipment
ppm	parts per million part of air, parts per million

ppt	parts per trillion
PUL	Pulmonary
SCBAF	Self Contained Breathing Apparatus with Full Face piece
SCI	Specific Chemical Identity - means the chemical name, Chemical Abstracts Service (CAS) registry number, or any other information that reveals the precise chemical designator of the substance
SKN	Skin effects
soln	solution
SOx	Oxides of sulphur
STEL	Short Term Exposure Limit
STP	Standard Temperature and Pressure
SYS	Systemic effects
TCC	Tg Closed Cup
TCLo	Lowest published toxic dose
temp	temperature
TER	Teratogenic effects
TFX	Toxic effects
TLm	Median Tolerance Limit
TLV	Threshold Limit Value
TOC	Tag Open Cup
torr	mm HG pressure
TWA	Time Weighted Average
UEL	Upper Explosive Limit
mg	Microgram (one-millionth, 10-6, of a gram)
VOC	Volatile organic compounds
>	greater than
<	less than

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D. Responsibilities and Functions

D-1. University Chemical Hygiene Officer (CHO)

The University Chemical Hygiene Officer (CHO) is charged with the responsibility of implementing and monitoring the chemical hygiene plan. The Chemical Hygiene Officer at Drexel University is Martin W. Bell. The Drexel University CHO can be reached at (215) 895-5892. The CHO’s functions include, but are not limited to the following responsibilities:

- The development of chemical hygiene policies and procedures.
- Conduct safety inspections of all university spaces.
- Assist PI's in complying with federal and state regulatory agencies and developing a healthy workplace environment.
- Conduct implementation and monitoring procedures in accordance with approved policies and procedures.
- Certify the performance of protective equipment.
- Monitor procurement, use, and disposal of chemicals used in the lab
- See that appropriate audits are maintained.
- Help supervisors develop precautions and adequate facilities.
- Know the current legal requirements concerning regulated substances.

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2. Principal investigator/Faculty Member/Laboratory Supervisor

The principal investigator/laboratory supervisor/faculty member has overall responsibility to:

- Ensure that workers know and follow the chemical hygiene rules that protective equipment is available and in working order, and that appropriate training has been provided.
- Provide regular, formal, chemical hygiene and housekeeping inspections including routine inspections of emergency equipment.
- Know the current legal requirements concerning regulated substances.
- Determine the required levels of protective apparel and equipment.
- Ensure that facilities and the training for use of any material being ordered are adequate.

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3. Laboratory employee/Student

The laboratory employee is responsible for:

- Planning and conducting each operation in accordance with Drexel University's chemical hygiene procedures.
- Developing good personal chemical hygiene habits

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E. Standard Operating Procedures

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E-1. Chemical Exposures

a. **Eye Contact**: Promptly flush eyes with water for a prolonged period (15 minutes), obtain information from MSDS and report to Employee/Student Health or nearest emergency room Safety and Health for evaluation.
b. **Ingestion**: Call Emergency Operator (9-911), Poison Control Center or Chemtrec. Do not induce vomiting or drink large quantities of water unless directed to do so by a medical professional.
c. **Skin Contact**: Promptly flush the affected area with water for 15 minutes. Remove all contaminated clothing. Use a safety shower when contact is extensive.

Note: In any of the above events, seek medical advice immediately. Phone or contact Drexel Security (215) 895-2222 and the University Department of Safety & Health at (215)-895-5907.

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E-2. Chemical Spills

In the event of a chemical spill immediately implement the appropriate spill control procedures as outlined below.

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E-3. Chemical Spill Control Procedures

a. Immediately turn off all ignition sources (i.e. open flame, heating mantle, etc.).
b. If contaminated with Hazardous material, immediately implement Personal Decontamination Procedures reference above in the Chemical Exposure Section or refer to Appendix I.
c. Asses the Risk
    - Identify material, (i.e. acid, caustic or solvent).
    - Determine if spill is a major spill (500 ml or an acutely hazardous material, or a minor spill (<500 ml of non-acutely hazardous material). Refer to Appendix II for list of acutely Hazardous Materials.
    - If major spill, implement the major spill procedures as outlined below in Item d. (Also, outlined in Appendix III).
    - All minor spills (<500 ml of non-acutely hazardous materials) will be cleaned-up by Faculty Member/Laboratory Supervisor/Principle Investigator. If minor spill, implement the minor spill procedures as outlined below in Item e. (Minor Spill Clean-up Procedures, also, outlined in Appendix IV.)
d. In the event of a major spill in a university area, all laboratory, education, maintenance, outside contractor, administrative, and/or environmental services personnel will implement the following plan:
    1. Notify persons in the immediate area that a spill has occurred.
    2. Avoid breathing vapors, mists or dust of the spilled material.
    3. Turn off all ignition sources.
    4. Evacuate room and close the door
    5. Contact the Emergency Operator DREXEL - Phone # 80 (using any in-house phone) Drexel – 215-895-2222 (University City Campus) In order to asses the situation be prepared to provide the following information:
        - Name and call back number
        - The location of the spill (building and room number)
        - Type of material spilled
        - The amount of material that spilled
    6. Remain on or near the telephone until you have received instructions from the emergency operator or security or University Safety & Health.
e. In the event of a minor spill all laboratory personnel (Laborartory Supervisor/Laboratory Technician/Principle Investigator/Faculty Member) will implement the following steps when cleaning-up a minor chemical spill:
    1. Review MSDS prior to clean-up.
    2. Proper personnel protection equipment will be donned during clean up of all hazardous materials. Personnel protection equipment selection charts will be referenced prior to cleaning up any spilled material(s). If the laboratory personnel does not have the proper personal protective equipment then contact University Safety and Health for assistance
    3. Contain spilled material(s) using absorbent pads and/or socks. Paper Towels will not be used for containment of spill nor will they be used for clean up.
    4. Neutralize spilled material(s) using the appropriate neutralizing agent.
    5. Clean up neutralized material using dustpan and/or plastic scoop.
    6. Place neutralized material in hazardous waste bags. Dispose of as hazardous waste.
    7. Wash area where spill has occurred with distilled water several times making sure no residue was left behind. Dispose of any towels used as hazardous waste.
    8. All emergency equipment shall be decontaminated and stored.
    9. All non-disposable personal protective equipment shall be decontaminated and stored.

10. All disposable personal protective equipment and clean up materials shall be disposed of as hazardous waste.
11. Always use extreme caution when cleaning up hazardous substances.

f. Report all minor spills involving the release of materials in quantities greater than 100 milliliters to the University Department of Safety & Health at 215-895-5907.

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E-4. Work Area Precautions

- Keep all work areas clean and free of clutter. Clean up the work area on completion of an operation or at the end of each work shift or class.
- Keep chemicals and equipment properly labeled and stored appropriately. Segregate chemicals as noted in Part 9 of this section. (For more information on Compatible Storage, refer to Appendix V).
- Do not store, handle or consume food or beverages in laboratory areas, refrigerators, or with glassware or utensils that are also used for laboratory operation.
- Seek information and advice about hazards, review MSDS (www.hazard.com) plan appropriate protective procedures, and plan positioning of equipment before beginning new operation.
- Leave lights on during work hours.
- Provide for containment of toxic substances in the event of failure of a utility service in an unattended operation.

Chemical Fume Hoods

- Use a hood for operations that might result in release of chemical vapors or fine powders and dust. Respirators may be necessary for work with some substances. If a substance's OSHA permissible exposure limit (PEL) can be predicted to be exceeded than a respirator will be necessary for work with that substance. Refer to Appendix VI for the OSHA PELs. Laboratory personnel and/or students must fulfill all the requirements set forth by the University's Respirator Protection program prior to working with respirators.
- As a rule of thumb, use a hood or other local ventilation device when working with any appreciably volatile substance having a TLV of less than 500 ppm. Refer to Appendix VII for a list of some TLVs. This list is not the complete list of TLVs. Contact the University Department of Safety and Health for the TLVs not list in Appendix VII.
- Confirm adequate hood performance before use (i.e. kimwipe test). Keep hood closed at all times except when adjustments within the hood are being made. Do not store chemicals in hoods for extended periods of time, and do not allow materials to block vents or airflow. Refer to the University's Chemical Fume Hood Plan for more details concerning chemical fume hoods.
- Leave the hood "on" when it is not in active use, if toxic substances are stored in it; or if it is uncertain whether adequate general laboratory ventilation will be maintained when it is "off."
- Be aware of any unsafe conditions and see that they are corrected when detected. Contact the University Department of Safety & Health for advice. The lab safety inspection form included in Appendix VIII of this manual will provide you with a list of items that should be inspected routinely.

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E-5. Procedural Precautions

General Precautions

- Mouth suction for pipetting or starting a siphon is strictly forbidden.

- Do not smell or taste chemicals.
- Apparatus that can discharge toxic chemicals (vacuum pumps, distillation columns, etc.) should be vented into local exhaust devices or Chemical Fume Hoods.
- Handle and store laboratory glassware with care to avoid damage. Do not use damaged glassware.
- Use extra care with Dewar flasks and other evacuated glass apparatus; shield or wrap them to contain chemicals and fragments in the event that implosion might occur.

Use equipment only for its designed purpose.

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E-5-1. Toxic Chemical Precautions

- Review the Material Safety Data Sheets prior to working with any toxic chemicals. Refer to the Appendix II for a list of toxic chemicals.
- Do not allow release of toxic substances in cold rooms or warm rooms, since these areas have contained re-circulated atmospheres.
- Do not use any chemicals that require ventilation in excess of your lab's capabilities. Most labs have between 6 and 12 air changes per hour. Chemicals requiring additional ventilation should be used only in hoods and glove boxes.
- Procedures involving highly toxic chemicals that can generate dust, vapors, or aerosols must be conducted in a hood, glove box, or other suitable containment device. Refer to Appendix to II for hazardous chemical lists.
- When working with toxic liquids or solids, it is critical that gloves be worn to protect the hands and forearms. These gloves must be carefully selected to ensure that they are impervious to the chemicals being used and are of appropriate thickness to allow reasonable dexterity while also ensuring adequate barrier protection. Contact the University Department of Safety & Health for assistance or glove selection.
- When using toxic substances that could generate vapors, aerosols, or dusts, additional levels of protection, including full-face shields and respirators, are appropriate, depending on the degree of the hazard represented.
- Equipment used for the handling of high toxic chemicals should be isolated from the general laboratory environment.
- After using toxic materials laboratory personnel shall wash his or her face, hands, neck and arms prior to leaving the laboratory.

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E-5-2. Radioactive Material Precautions

- Prior to working with any radioactive material contact the Radiation Safety Department (215-762-4050) for the current regulations concerning radioactive materials.
- Know the characteristics of the radioisotopes that are being used, including half-life, types and energies of emitted radiations, the potential for exposure, how to detect contamination, and the annual limit on intake.
- Dispose of waste radionuclides and their solutions appropriately. Contact the Radiation Safety Department or the University Department of Safety and Health concerning proper disposal procedures.
- Plan experiments so as to minimize exposure by reducing the time of exposure, using shielding against exposure, increasing your distance from the radiation, and paying attention to monitoring and decontamination.
- Keep an accurate inventory of radioisotopes.
- Place only materials with known or suspected radioactive contamination in appropriate radioactive waste containers.

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E-5-3. Flammable Material Precautions

- Handle flammable substances only in areas free of ignition sources. Besides open flames, ignition sources include electrical equipment (especially motors), static electricity, and, for some materials (e.g., carbon disulfide), even hot surfaces.
- Check the work area for flames or ignition sources prior to using a flammable substance.
- Never heat a flammable substance with an open flame. Preferred heat sources include steam baths, water baths, oil and wax baths, salt and sand baths, heating mantles, and hot air.
- Keep containers of flammable substances tightly closed at all times when not in use.
- Use only refrigeration equipment certified for storage of flammable materials.

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E-6. Protective Clothing And Other Precautions

- Remove laboratory coats immediately upon significant contamination.
- Open-toed footwear cannot be worn in laboratories. Avoid wearing sandals, perforated shoes, sneakers or any shoes made of canvas.
- Shorts cannot be worn in Drexel University laboratories.
- Do not wear contact lenses in the laboratory.
- Disposable or special gloves, chemical aprons, goggles or eye shields must be used whenever appropriate.
- Disposable gloves must never be worn in hallways, elevators, or public areas of the university. If hazardous materials must be transported from one area to another, glove one hand to hold the product / apparatus or push cart and use a clean ungloved hand to open doors, press buttons, etc.
- Inspect all gloves before each use. Wash them before removal. Dispose of them appropriately.
- Reusable gloves should be washed and inspected before and after each use. Gloves that might be contaminated with chemicals should not be removed from the immediate area in which the chemicals are located.
- Eating, drinking, smoking, chewing gum or applying cosmetics in the laboratory is strictly forbidden. Lunches are not to be stored in standard laboratory refrigerators, but may be kept in the designated refrigerators.
- Wash areas of exposed skin thoroughly before leaving the laboratory.
- Confine long hair and loose clothing.
- Avoid practical jokes or other behavior that might confuse, startle or distract another worker.
- Refer to Section H of this plan for information concerning Personal Protective Equipment.

Note: Please contact the University Dept. of Safety and Health for additional information on precautionary measures, i.e., housekeeping, gas cylinders, hazard warnings, etc.

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E-7. Chemical Inventory

An inventory of all hazardous chemicals (refer to Appendix II for a list of hazardous substances or to individual MSDS) and non-hazardous chemicals must be conducted in each laboratory. One copy of this inventory will be maintained by the P.I./Faculty Member, a second copy will be maintained in each lab as the first page of the MSDS book and a third copy will be sent to the University Department of Safety & Health.

Additional inventories must be prepared annually. As new chemicals are obtained, chemical inventory sheets must be updated accordingly.

The PI/Laboratory Supervisor/Faculty Member takes complete responsibility for compliance.

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E-8. Material Safety Data Sheets (MSDS)

MSDS must be kept in each laboratory in a labeled binder. The MSDS should be filed in alphabetical order along with the chemical inventory for that particular laboratory.

If MSDS are missing from a particular chemical inventory, request letters should be sent to the applicable manufacturer or vendor. Vendors and manufacturers are required by federal law to provide MSDS upon request, free of charge, within a reasonable time frame. Additional sources for obtaining MSDS include the internet at:

www.hazard.com
http://ntp-server.niehs.nih.gov/ and
www.hhmi.org/science/labsafe/lcss/

The PI/Laboratory Supervisor/Faculty Member is responsible to ensure that the entire MSDS book from each laboratory, including the chemical inventory and annual updates, is photocopied and sent to the University Department of Safety and Health, at Mail Stop 622.

The PI/Laboratory Supervisor/Faculty Member is responsible for reviewing the MSDS and recording which materials are carcinogenic, mutagenic or teratogenic. This information must be conveyed to all students and/or employees engaged in research in his/her laboratories, including locations used and stored within the lab. This information must be posted at the entrance to each lab in an effort to inform any individual who may need to enter that space. A copy of this information must be sent to the University Department of Safety and Health.

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E-9. Chemical Storage

All hazardous chemicals must be stored in clearly defined designated areas in accordance with this manual and OSHA Regulation 29 CFR 1910.1450 also known as the “Laboratory Standard”. These storage guidelines must be followed when storing hazardous chemicals:

- The chemical inventory should be kept as small as possible.
- Do not store chemicals on top of high cabinets or shelves.
- Keep exits, passageways, areas under tables, and emergency equipment areas free of stored chemicals.
- Provide a definite storage place for each chemical and return the chemical to that location after each use.
- Avoid storing chemicals on bench tops and in fume hoods, except for those chemicals being used currently.
- Do not store chemicals on the floor.
- Store chemicals in a cool dry place avoiding direct sunlight.
- Ventilated storage cabinets shall be used to store extremely hazardous chemicals.
- Use chemical storage refrigerators only for chemical storage. Label these refrigerators with the following signage: “No Food or Drink – Chemical Storage Only”
- Do not store flammable liquids in a refrigerator unless it is an approved explosion-proof refrigerator.
- Safety containers must be used when transporting chemicals (i.e. carts, rubber totes, secondary containers etc).
- Observe all precautions regarding the storage of incompatible chemicals.
- Dry chemicals (solid materials) shall not be stored with liquid chemicals.
- Separate chemicals into the following hazard classes:
    1. Flammables
    2. Acids
        - Organic Acids

    - Inorganic Acids
  3. Bases
    - Organic Bases
    - Inorganic Bases
  4. Oxidizers
  5. Reactives
  6. Poisons (Toxic)
  7. Non-hazardous or non-regulated chemicals.
- Store all flammable liquids in a grounded flammable storage cabinet with self-closing doors. Proper ventilation must be provided according to current NFPA standards.
- Organic Acids can be stored in the flammable storage cabinet; however, overspill containers must be used to contain any spills.
- Acids must be stored separate from bases. Storage in the same cabinet is possible ONLY IF OVERSPILL CONTAINERS ARE USED TO CONTAIN ANY SPILLS.
- Separate inorganic and organic bases. These can be stored in the same cabinet. Shelves or overspill containers can be used as a means of separation.
- Oxidizers must be stored in a cabinet separate from all other chemicals.
- Reactive chemicals must be segregated and stored appropriately i.e. flammable cabinet, explosion proof refrigerator, dedicated container etc.
- Toxic chemicals, including carcinogens, must be properly labeled and stored in ventilated storage areas; small containers should be stored together in unbreakable chemical-resistant secondary containers. These containers must be labeled either “Caution: High Chronic Toxicity,” or “Cancer Suspect Agent.”
- As stated above, a separate inventory list of carcinogens, mutagens and teratogens is to be forwarded to the University Department of Safety and Health in accordance with Federal and State Regulations.
- Alphabetical storage of all dry chemicals is not allowed. This may result in incompatibles appearing together on a shelf. Dry chemicals should first be segregated appropriately then stored alphabetically within each hazard class.
- Cylinders of compressed gases, empty or full, must be labeled, strapped or chained at all times to a wall or bench top, and must be capped when not in use.
- Oxygen and other oxidizing gases must not be stored adjacent to flammable gases (except when in use).
- Do not store flammable gases near sources of heat or ignition.
- If unable to determine the best possible storage options consult the MSDS for the chemical. If further assistance is need contact the University Department of Safety and Health:

Martin Bell - 215-895-5892
Phil Leo - 215-895-5909

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E-10. Labeling

OSHA requirements for labeling under the Chemical Hygiene Plan will be the same as those defined in the hazard communication standard 1910.1200. Therefore, all containers in the workplace must contain the following information:

1. Identity of the substance (complete chemical name).
2. Appropriate hazard warnings (completed NFPA diamond is acceptable).
3. Name and address of chemical manufacturer, importer, distributor, or other responsible party (if made in lab list laboratory contact).

All labels must be prominently displayed and legibly written (printed) in English and other language as appropriate for employees. It is the responsibility of the principal investigator to inspect all incoming shipments of containers of hazardous chemicals to ensure that they bear labels with the appropriate information.

If a container is improperly labeled, the PI/Laboratory Supervisor/Faculty Member or the PI's /Laboratory Supervisor’s/Faculty Member’s designee must contact the Safety Office (215-762-3632), who will notify the vendor

for correction, and the receiving department for informational purposes.

Portable containers used for purposes of transferring hazardous material from a labeled container for immediate and complete use by an investigator or his /her technicians or research staff or student do not require labeling . However, if the transferred hazardous material is to be used by other research personnel/student, or is not immediately used, it is the responsibility of the investigator/lab supervisor/faculty member/student/lab technician for whom the chemical material was first intended, to properly label the portable container.

Place appropriate signs on the door. Remove all other materials from outer door surface (i.e. old labels, signs etc.)

The laboratory entrance door shall be labeled as follows:

1. NFPA diamond. Laboratory personnel shall fill in the diamond with the highest hazard number pertaining to their laboratory.
2. Biohazard label and appropriate Biosafety Level (if applicable).
3. Radiation Hazard Label (if applicable).
4. Emergency contact information. The information should include a name and number to contact in the event of an emergency. It must be clearly visible and placed in one of two locations:
    a. Outer laboratory door
    b. Within laboratory immediately to the right of each door
5. Additional warning labels as applicable, i.e. "carcinogen in use", "water reactive materials", “inhalation hazard, respiratory protection required in this area", "high noise, hearing protection required in this area”, etc.

All cabinets, shelves and refrigerators containing chemical storage (including the cleaning supplies) must be labeled with the appropriate warning label (i.e. Flammable, Acids, Bases, Oxidizers etc). Refrigerators used for chemical storage must be labeled, with appropriate hazard warnings and with the signage: "NO Food or Drink - Chemicals Storage Only." Any refrigerator used of food or drink storage must be label as such.

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F. ENGINEERING CONTROLS

1. **Chemical Fume Hoods, Biological Safety Cabinets and Ventilation**

    All chemical fume hoods and laminar flow hoods must be inspected annually and certified. Any hood not providing 80 to 120 linear feet per minute of airflow or manufactures recommended value must not be used. Inspections of chemical fume hoods are routinely conducted by the University Department of Safety & Health at no cost to the investigator or department. If chemical fume hoods do not meet specifications, they will be taken out of service immediately and are not to be used until the hood has met the criteria for certification. Refer to the University’s Chemical Fume Hood Policy for more information.

    The annual inspection and certification of laminar flow hoods and biosafety cabinets is scheduled through the University Department of Safety & Health, the costs associated with these certifications are the investigator’s/faculty member’s responsibility. It is the responsibility of the principal investigator/faculty member/laboratory supervisor to certify, repair or replace such unit(s) in a timely fashion so as not to endanger the health and well-being of employees/students or place them at risk. Refer to the University’s Biological Safety Cabinet Policy for more information.

    Work involving chemicals with high vapor pressures or low threshold limit values (TLVS) should always be done within a fume hood. Refer to Appendix VII for TLVs or contact the Safety Office (215-762-3632) for chemicals not on the list.

    Airflow through each laboratory should normally be not less than 20 cubic feet per minute, and exhausted to

the exterior of the building. Quality and quantity of ventilation are monitored and records are maintained by Drexel University Facilities Management. If you need information on this, please contact Drexel Facilities.

2. **Eyewash Fountains and Safety Showers**

   Eyewash fountains must be inspected every once a week by the PI/Faculty Member/Laboratory Supervisor and records are maintained by the principal investigator/Faculty Member/Laboratory Supervisor. Inspection forms are included in the Appendix IX of this manual.

   The University Department of Safety and Health inspects eyewash station quarterly inspections and requires an annual certification by the University Facility Department. All records will be maintained by the University Department of Safety and Health.

   Safety showers are inspected, tested, and flushed quarterly and records are maintained by the University Department of Safety and Health. Inspection forms are included in the Appendix IX of this manual.

3. **Fire Safety**

   All laboratory personnel and/or students shall know the locations of the locations of all the fire extinguishers, fire blankets (if present) and the fire alarms.

   The Principle Investigator/Laboratory Supervisor/Faculty Member shall post laboratory evacuation procedures. All laboratory personnel and students shall be familiar with these evacuation procedures.

   Fire extinguishers are inspected annually and recharged and/or replaced accordingly by the Facilities Dept., contact (215) 895-2808 for service.

   Long-term storage of chemicals should be in a well-ventilated, secure chemical storage area in accordance with NFPA requirements.

   All cold rooms and warm rooms have provisions for rapid escape in the event of electrical failure. Escape instructions should be posted on the inside of the entrance door of each cold or warm room.

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G. PERSONAL EXPOSURE MONITORING

Upon request of the PI/Faculty Member/Laboratory Supervisor/Student/Laboratory personnel, the University CHO will review laboratory work practices and normal operations in an effort to determine if Drexel employees are at risk of exposure to regulated substances in accordance with the OSHA permissible exposure limits and action levels as outlined in 29 CFR 1910.

Initial and annual surveillance monitoring (environmental and personal) will be conducted whenever exposures to hazardous agents are anticipated to exceed the action level, the American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit values (TLV) or OSHA'S PEL. Additionally, monitoring will be conducted when:

- Past monitoring has indicated elevated exposures,
- When requested by an employee or student,
- When an employee or student experiences signs or symptoms of overexposure, or
- When laboratory operations change such that and area previously identified as not expected to have significant exposure would now be expected to have elevated concentrations of hazardous agents

All personal exposure monitoring activities (including sampling, analysis and record keeping) will be performed in accordance with OSHA requirements and/or NIOSH recommended practices.

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H. PERSONAL PROTECTIVE EQUIPMENT

The University Department of Safety and Health requires that appropriate eye protection is worn by all persons in laboratories and areas where chemicals are used or stored.

Eye protection consists of safety glasses with side shields, goggles or face shield, or full-face respirator. Chin-length face shields are to be worn to prevent splashes or sprays of blood, infectious materials, or hazardous chemicals when there is a potential for eye, nose, or mouth contamination.

Employees/students are required to wear appropriate gloves when an employee has the potential for direct contact with blood, hazardous chemicals, infectious agents, or other hazardous materials.

Select gloves appropriate for the task. Gloves protect differently for each chemical. For more information concerning glove selection contact University Department of Safety & Health.

Lab coats and gloves must be worn only in the laboratory area and are to be removed upon exiting the laboratory. Lab coats are worn to protect street clothes from hazardous materials.

When the use of respirators, in research laboratories, is necessary to maintain exposure below the permissible exposure limit (PEL), the respirator will be provided by the PI at no cost to the employee. The University Department of Safety and Health will provide students, at no cost, with respirators when the use is necessary to maintain exposure below the permissible exposure limit (PEL).

The proper respiratory equipment can be obtained from the University Department of Safety & Health (215) 895-5907 (Center City Campus). The respirators shall be selected and used in accordance with the requirement of 29 CFR 1910.134 and ANSI Z88.2-1969. Training, an annual physical and pulmonary function test will be required for all individuals requiring the use of respirators in accordance with OSHA's standards on respiratory protection 29 CFR 1910.134.

Use appropriate respiratory equipment when air contaminant concentrations are not sufficiently restricted by engineering controls. The odor threshold for many chemicals is much lower than the permissible exposure limit, and in many circumstances is a great indicator of exposure. Refer to the Odor Threashold Chart, Appendix VII, and the OSHA PEL list, Appendix VI, to determine if a respirator is required.

The requirements set forth in the University's Respirator Protection Policy must be fulfilled prior to performing work with a respirator. Contact the University Department of Safety and Health to enroll in the program.

Use any other protective apparel and equipment as appropriate. Know the locations of PPE and how to obtain additional materials when necessary. If appropriate PPE is not readily available do not initiate experiments involving hazardous chemicals.

The Principle Investigator shall provide proper personal protection equipment for all personal in the research laboratory.

Faculty Members/Laboratory Supervisors shall require students to obtain the appropriate PPE prior to commencing any laboratory activities. For proper PPE selection contact the University Department of Safety and Health.

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I. WASTE REMOVAL/DISPOSAL

The Waste Disposal Program provided at Drexel University for the collection, segregation, storing, transport, and incineration of contaminated materials is designed in accordance with the Pennsylvania Department of Environmental Protection (PADEP), the US Environmental Protection Agency (EPA) and the US Department of Transportation (USDOT) to minimize possible harm to people, other organisms and the environment. Refer to the university's hazardous waste management plan for waste removal/ disposal operations.

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I-1. Drain Disposal

The University Department of Safety & Health will permit drain disposal of elementary neutralized (ph adjustment of waste that are hazardous only because they exhibit the corrosivity characteristic) acidic and caustic aqueous solutions. The elementary neutralized aqueous solution must have a final ph value between 6 and 9. Disposal must not exceed a rate greater than 50 ml/min. while flushing. These compounds should be flushed with at least 10 volumes of excess water.

All drain discharges will be documented on a log sheet located near the point of discharge. The log sheet shall contain the date of discharge, the chemical name, the volume discharged and the pH value. The University Department of Safety & Health will collect the log sheet bimonthly. Each log sheet will be kept in a room specific file for one year.

The University Department of Safety & Health shall prohibit the drain disposal of the following:

- Flammable or explosive pollutants
- Pollutants that will cause corrosive structural damage to the Publicly Owned Treatment Works (POTW), but in no case discharges with pH lower than 5.0.
- Solid or viscous pollutants that may cause an obstruction of flow in the POTW
- Pollutants capable of releasing fumes or vapors
- Pollutants, including oxygen-demanding pollutants (high biological oxygen demand), which may cause interference with the POTW
- Wastewater with sufficient heat to inhibit biological activity in the POTW (must not exceed 104 F at the POTW)
- Petroleum, oil, non-biodegradable cutting oil or products of mineral oil origin in amounts that will cause interference or pass through
- No organic chemicals
- No heavy metal solutions

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I-2. Incineration

Incineration, in an environmentally acceptable manner, is the most practical disposal method for combustible laboratory waste. Indiscriminate disposal by pouring waste chemicals down the drain or adding them to mixed refuse for landfill burial is unacceptable.

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I-3. Hoods and recycling

Hoods are not to be used as a means of disposal for volatile chemicals. Disposal by recycling or chemical decontamination must be used whenever possible.

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I-4. Waste removal

Researchers rid their labs of unwanted materials by completing the Chemical Pick-Up Request Form (see the Appendix X of this Plan) and faxing it to the University Department of Safety and Health at 215-895-5926 . Waste is removed from the laboratories to the long-term central waste storage area at regular intervals. Storage is allowed from the generation of the waste up to 90 days. Drexel University stores its hazardous waste at its central storage area from which it is transported every 90 days for disposal.

Residual materials (less than 1 milliliter) may be rinsed from containers and disposed of down the drain. The remaining glassware should be cleaned, triple rinsed, labels defaced, and disposed of as municipal waste. All broken glassware should be disposed of in approved sharps containers.

Refer to the University's Hazardous Waste Management Plan for more information on waste disposal. possible.

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J. ADMINISTRATIVE CONTROLS

The safe operation of each laboratory is the responsibility of the respective PI/Faculty Member/Laboratory Supervisor, while the overall responsibility for the enforcement of the chemical hygiene plan rests with the University Department of Safety and Health. Policy and implementation procedures pertaining to the CHP require approval by the University Department of Safety and Health.

The administrative controls enforced at Drexel University include, but are not limited to:

1. Restricted access and proper signage on all entrances leading to areas containing agents that may be immediately dangerous to life or health.
2. Proper labeling on laboratory doors, cabinets and containers containing potentially hazardous materials.
3. The observation of Standard Universal Precautions when working with blood and bodily fluids of humans and animals, recombinant DNA or potentially pathogenic bacterial or viral agents.
4. The contents of the lab safety manual and the radiation safety manual and all applicable federal and state regulations established to protect human health and the environment.
5. If a chemical is produced for another user at Drexel University or at another facility, the researcher shall comply with the hazard communication standard 29 CFR 1910.1200 (www.osha.gov/comp-links.html), including the requirements for preparation of material safety data sheets and labeling.
6. Environmental monitoring is required in all laboratories using the chemicals listed in OSHA Standard 1910 Subpart Z - Toxic And Hazardous Substances that would generate anticipated exposures in excess of the action level or the TLV.
7. Chemical spill response must be performed in accordance with this manual. Laboratory personnel are responsible for cleaning up spills of materials that are not acutely hazardous in quantities of less than 500 ml. Laboratory personnel are responsible for containing and reporting larger spills and/or spills of acutely hazardous materials such as phenol.
8. Procedures for containing and/or cleaning chemical spills have been developed in accordance with OSHA guidelines and are described in Section E, Part 3 of this Plan.

9. All chemical spills greater than 100 milliliters must be reported to the University Department of Safety and Health immediately at (215) 895-5907 .
10. To contain a chemical spill, remember to "C.L.E.A.N."
    a. Contain the area. b. Leave the area. c. Emergency: eye wash, shower, medical care. d. Access MSDS. e. Notify the CHO.
11. Appropriate spill kits must be maintained in each lab or in centralized common areas accessible by all lab personnel. It is the responsibility of the PI/Faculty Member/Laboratory Supervisor to ensure that ample spill materials are available and that laboratory personnel are familiar with locations and use of these materials.

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K. MEDICAL CONSULTATIONS AND EXAMINATIONS

The principal investigator or lab supervisor is authorized to obtain pre-employment medical services from the Student Health Office, located at Presbyterian Hospital, 39th & Powelton Avenue, (215) 662-8233, including appropriate vaccinations, baseline medical monitoring and physicals as required under federal and state regulations for those individuals who have a potential for exposure. Additional medical services / consultations may be recommended by the University Department of Safety & Health prior to the approval of protocols involving the use of extremely hazardous or pathogenic agents.

The principal investigator or lab supervisor is authorized to obtain medical consultation in work-related emergency cases. All employees needing medical attention will use the Employee/Student Health Services located at Presbyterian Hospital, 39th & Powelton Avenue, (215) 662-8233.

All injury-related examinations and consultations are performed by or under the direct supervision of one of panel of licensed physician’s without cost to the employee, without loss of pay, and at a reasonable time and place.

The employee is sent for medical evaluation:

1. Whenever signs and symptoms associated with a hazardous chemical develop.
2. When environmental monitoring reveals an exposure level routinely above the action level.
3. Whenever an event takes place in the work area such as a spill, leak, or explosion resulting in hazardous chemical exposure.

The employee’s supervisor, Risk Management or University Department of Safety & Health will provide the following information to the physician:

1. Identity of the hazardous chemical(s) to which the employee may have been exposed.
2. A description of the conditions under which the exposure occurred, including quantitative exposure data (if available).
3. A description of the signs and symptoms of exposure.
4. A copy of the MSDS for the chemicals involved.

The physician will provide a written opinion that will not reveal specific findings of diagnosis unrelated to the exposure but will include:

1. Any recommendation for further medical follow-up.
2. Results of the medical examination and any associated tests.
3. Any medical condition that may be revealed in the course of the examination that may place the employee at increased risk as a result of exposure to a hazardous chemical found in the workplace.
4. A statement by the physician that the employee has been informed of the consultation and examination results

and any medical condition that may require further examination or treatment.

All such medical records will be kept for at least as long as the employees affected are employed. OSHA requires some records to be kept for 30 years beyond the employee's time of employment. The laboratory standard requires that all records be maintained of all exposure evaluations, medical consultations, and reports and that those records be maintained in accordance to 29 CFR 1910.20. That section requires those records to be maintained for at least 30 years and describes the accessibility procedure for maintaining the records.

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L. TRAINING

Training is a necessary and important part of the Chemical Hygiene Plan (CHP). All employees will be trained at the time of their initial assignment to a work area where hazardous chemicals are present. The PI or the PI's designee is responsible for training all employee(s) whose assignment(s) are to a work in an area where hazardous chemicals are, or may be present. For this purpose, supervisors may be trained by the Chemical Hygiene Officer through "train-the-trainer" sessions. Such sessions shall be documented by written attendance records.

The following is a list of the lesson plan for that session:

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L-1. Objectives

Upon completion of the chemical hygiene training program, the employee will be able to:

1. Locate the hazardous chemicals in the workplace and identify them as carcinogenic, mutagenic, teratogenic, poisonous, flammable or caustic as strong acids or bases.
2. Recognize the chemical labeling (NFPA) and understand its meaning.
3. Locate the MSDS file in the lab, university and on the web (www.hazard.com/MSDS)
4. Locate the health hazard, physical hazard, environmental protection, and special protection sections of the MSDS and explain their usage.
5. Identify the name and contact number of the Emergency Operator, Security, the Chemical Hygiene Officer and the PI.
6. Discuss the major components of the facility's standard labeling system for hazardous waste.
7. Identify appropriate protective clothing associated with their job and demonstrate its use.
8. Demonstrate emergency procedures in the event of a fire or hazardous chemical spill.
9. Describe the environmental monitoring protocol.

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L-2. Training Program

A. Content of the OSHA laboratory standard and hazard communication standard
B. Location of CHP
C. Identification of hazardous chemicals
    1. Location of chemical inventory
    2. Location of MSDS

   a. MSDS book in lab
   b. University safety office
   c. www.hazard.com/MSDS
3. Labeling information
   a. Hazard warnings - NFPA diamond b. Carcinogen, teratogen, mutagen warnings c. Location in workplace
4. Procedures for handling hazardous chemicals
   a. Work practices
   b. Proper moving, storage, and use
   c. PEL for specific chemicals used by the employees
   d. Visual appearance of chemicals used by the employee
   e. Environmental monitoring required
   f. Signs and symptoms of exposure
   g. Location of target organ poster
   h. Protective equipment used to prevent overexposure
   i. Locations of eyewash and emergency shower, fire extinguishers, fire alarm pull stations, emergency exit and alternative exit
   j. Conditions to avoid
5. Environmental protection
   a. Emergency procedures
   b. Spill containment
   c. Medical consultation procedures
6. Documentation of training - sign in sheet with date, location, printed name, signature, social security number, department, title, contact number, name and title of trainer.

All employees trained by the supervisor must be documented as noted above. Copies of this documentation must be forwarded to the University Department of Safety and Health.

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M. HOUSEKEEPING

Environmental services responsibilities at Drexel University are performed under the supervision of the Facility Department Environmental Services Supervisor and that individual is charged with the responsibility to supervise the performance of the following functions:

- Maintain the floors of laboratories, hallways and all areas of Drexel University in clean condition and free of obstruction.
- Removal of municipal which has been deposited in appropriate receptacles and properly removed from laboratory areas.
- Assist, when so directed, to clean spills of bodily fluids.
- Assist in obtaining proper storage to minimize clutter.
- Conduct training and instructional programs to ensure that all housekeeping employees are fully informed about the risks associated with laboratory research and all other activities at Drexel University.

Laboratory personnel/students shall keep all work areas, (i.e. bench tops, fume hoods, floor, emergency equipment, refrigerators, etc.), clean and free from clutter.

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N. RECORDKEEPING

Drexel University will establish and maintain an accurate record for each employee requiring environmental monitoring, medical consultations, and examinations, including tests or written opinion as required.

Accident Reports are written by the PI or lab supervisor. They are forwarded to the University Department of Safety & Health. All workers' compensation claims and accidents that require hospitalization are filed accordingly.

Inventory records for high-risk substances must be maintained by the PI. A copy of the inventory must be sent to the University Department of Safety & Health.

Environmental monitoring records are maintained by the University Department of Safety & Health.

Medical consultation records are maintained by Employee Student Health. Drexel Human Resources Department will maintain a digital database outlining the pre-employment services that have been provided to each employee.

Training attendance records are maintained by the University Department of Safety & Health.

All records are kept, transferred, and made available for regulatory agencies and in accordance with 29 CFR 1910.20.

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O. DOCUMENTS OF REFERENCE

The following documents were used for reference purposes. Copies of these documents are available in the University Department of Safety & Health.

1. Federal Register - Part II, Department of Labor, Occupational Safety and Health Administration 29 CFR Part 1910. "Occupational Exposures to Hazardous Chemicals in Laboratories"; Final Rule.
2. Furr, A. K.(2000).CRC Handbook of Laboratory Safety.5th ed.United States:CRC Press LLC.
3. National Research Council.(2000).Prudent Practices in the Laboratory - Handling and Disposal of Chemicals.3rd ed.United States:National Academy Press.

American Chemical Society.(1995).Safety in Academic Chemistry Laboratories.6th ed.United States:American Chemical Society.

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APPENDIX I

Personal Decontamination Procedures

If injured or contaminated with a hazardous substance these procedures will be implemented immediately prior to cleaning up or reporting spill.

- For spills contacting the of skin, follow these procedures:
    1. Immediately flush with flowing water for no less than 15 minutes (i.e. sink or safety shower).
    2. If there is no visible burn, wash with warm water and soap, removing any jewelry to facilitate clearing of any residual material.
    3. Check the material safety data sheet to see if any delayed effects should be expected. If the MSDS is not available contact University Department of Safety and Health immediately.
    4. Seek medical attention for even minor chemical burns.
    5. Do not use creams, lotions, or salves.
- For spills on clothing, follow these procedures:
    1. Do not attempt to wipe the clothes.
    2. Quickly remove all contaminated clothing, shoes, and jewelry while using the safety shower.
    3. Seconds count, so do not waste time because of modesty

4. Take care not to spread the chemical on the skin or, especially, in the eyes.
5. Use caution when removing pullover shirts or sweaters to prevent contamination of the eyes; it may be better to cut the garments off.
6. Immediately flood the affected body area with warm water for no less than 15 minutes. Resume if pain returns.
7. Get medical attention as soon as possible. Discard contaminated clothes as hazardous waste or have them laundered separately from other clothing.

- For splashes into the eye, take these steps:
  1. Using the eyewash immediately flush for at least 15 minutes.
  2. Hold the eyelids away from the eyeball, and move the eye up and down and sideways to wash thoroughly behind the eyelids.
  3. Get medical attention immediately. Follow first aid by prompt treatment by a member of a medical staff or an ophthalmologist who is acquainted with chemical injuries.

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Appendix 2

Click here for a downloadable version of Exhibit 2: Acutely Hazardous Material

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Appendix III

Hazardous Material Spill Procedures for Major Spills

The following procedure applies to:
- Laboratory personnel
- Education personnel
- Maintenance personnel
- Outside Contractor Personnel
- Environmental Services personnel
- Administrative personnel

In the event of a major spill in a university area, all laboratory, education, maintenance, outside contractor, administrative, and/or environmental services personnel will implement the following plan:

1. Notify persons in the immediate area that a spill has occurred.
2. Avoid breathing vapors, mists or dust of the spilled material.
3. Turn off all ignition sources.
4. Evacuate room and close the door
5. Contact the Emergency Operator :

   DREXEL - Phone # 80 (using any in-house phone)
   Drexel - 215-895-2222 (University City Campus)

   In order to asses the situation be prepared to provide the following information:
   - Name and call back number
   - The location of the spill (building and room number)
   - Type of material spilled
   - The amount of material that spilled

6. Remain on or near the telephone until you have received instructions from the emergency operator or security or University Safety & Health.

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APPENDIX IV

Hazardous Material Spill Procedures For Minor Spills

In the event of a minor spill the following emergency procedures shall be implemented.

Occupied Laboratories:

- Laboratory personnel will be responsible for the containment and clean up of all minor spills.
- Proper personal protection equipment shall be donned during the clean up of all minor spills. If the laboratory personnel does not have the proper personal protective equipment then contact the University Department of Safety & Health for assistance All non-disposable personal protective equipment shall be decontaminated and stored.
- All disposable personal protective equipment and clean up materials shall be disposed of as hazardous waste.
- If the material spilled is not covered under the minor spill definition (less than 500 ml of non-acutely hazardous material) then laboratory personnel shall implement the major spill procedures.

Education and Vacant Laboratories:

All minor spills occurring in vacant laboratories, education/prep laboratories, or any other university area shall be considered a major spill. Therefore, anyone observing a minor spill in these areas shall implement the major spill procedures.

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Appendix V

Appendix V. RELATED AND COMPATIBLE STORAGE GROUPS

INORGANIC FAMILY	ORGANIC FAMILY
metals, hydrides	acids, anhydrides, peracids
halides, sulfates, sulfites, thiosulfates, phosphates, halogens	alcohols, gycols, amines, imines, imides
amides, nitrates, (except ammonium nitrate), nitrites, azides	hydrocarbons,esters, aldehydes
hydroxides, oxides, silicates, carbonates, carbon	ethers, ketones, ketenes, halogenated hydrocarbons, ethylene oxide
sulfides, selenides, phosphides, carbides, nitrides	epoxy compounds, isocyanates
chlorates, perchlorates, perchloric acid, chlorites, hypochlorites, peroxides, hydrogen peroxide	peroxides, hydroperoxides, azides
arsenates, cyanides, cyanates	sulfides, polysulfides, sulfoxides, nitrites

borates, chromates, manganates, permanganates	
nitric acid, other inorganic acids	phenols, cresols
sulfur, phophorous, arsenic, phosphorous pentoxide	

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Appendix VI

Click here for a prinatble PDF version of the Regulations for Air Contaminents list

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Appendix VII

APPENDIX VII

ODOR AS AN AID TO CHEMICAL SAFETY*

CHEMICAL	TLV (PPM)	AOT (PPM)
ACETONE	750	13
AMMONIA	25	5.2
ARSINE	0.05	0.5
CARBON MONOXIDE	50	100,000
CHLORINE	1	0.31
CHLOROFORM	10	85
P-DICHLOROBENZENE	75	0.18
ETHYL ALCOHOL	1000	84
ETHYL ETHER	400	8.9
HYDROGEN SULFIDE	10	0.008
METHYL ALCOHOL	200	100
METHYLENE CHLORIDE	100	250
NAPHTHALENE	10	0.084
OZONE	0.1	0.045
PHENOL	5	0.04
TOLUENE	100	2.9
VINYL CHLORIDE	5	3000
M-XYLENE	100	1.1

EXTRACTED FROM THE JOURNAL OF APPLIED TOXICOLOGY. VOL. 3 (6), 1983

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Appendix VIII

Click here for a Printable PDF version of the Drexel and MCPHU Laboratory Safety Self-inspection Checklist

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Appendix IX

Click here for a Printable PDF version of The Eyewash/Safety Shower Quarterly Inspection Checklist

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Appendix X

Click here for a Printable PDF version of The Chemical Pick Up/Chain of Custody Form

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