

I. Scope and application:

- A. This section shall apply to all employers engaged in the laboratory use of hazardous chemicals as defined below.
- B. Where this section applies, it shall supersede, for laboratories, the requirements of all other OSHA health standards in 29 CFR part 1910, subpart Z, except as follows:
 - 1. For any OSHA health standard, only the requirement to limit employee exposure to the specific permissible exposure limit shall apply for laboratories, unless that particular standard states otherwise or unless the conditions of paragraph IB 3 of this section apply.
 - 2. Prohibition of eye and skin contact where specified by any OSHA health standard shall be observed.
 - 3. Where the action level (or in the absence of an action level, the permissible exposure limit) is routinely exceeded for an OSHA regulated substance with exposure monitoring and medical surveillance requirements paragraphs IV and VIIIA 2 of this section shall apply.
- C. This section shall not apply to:
 - 1. Uses of hazardous chemicals which do not meet the definition of laboratory use, and in such cases, the employer shall comply with the relevant standard in 29 CFR part 1910, subpart 2, even if such use occurs in a laboratory.
 - 2. Laboratory uses of hazardous chemicals which provide no potential for employee exposure. Examples of such conditions might include:
 - a. Procedures using chemically-impregnated test media such as Dip-and-Read tests where a reagent strip is dipped into the specimen to be tested and the results are interpreted by comparing the color reaction to a color chart supplied by the manufacturer of the test strip; and
 - b. Commercially prepared kits such as those used in performing pregnancy tests in which all of the reagents needed to conduct the test are contained in the kit.

II. Definitions:

- A. **"Action level"** means a concentration designated in 29 CFR part 1910 for a specific substance, calculated as an eight (8)-hour time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.
- B. **"Assistant Secretary"** means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.
- C. **"Carcinogen"** (see "select carcinogen").
- D. **"Chemical Hygiene Officer"** means an employee who is designated by the employer, and who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan. This definition is not intended to place limitations on the position description or job classification that the designated individual shall hold within the employer's organizational structure.

- E. "Chemical Hygiene Plan" means a written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment and work practices that:
1. Are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace, and;
 2. Meets the requirements of paragraph V of this section.
- F. "Combustible liquid" means any liquid having a flashpoint at or above 100° F (37.8° C), but below 200° F (93.3° C), except any mixture having components with flashpoints of 200° F (93.3° C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.
- G. "Compressed gas" means:
1. A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70° F (21.1° C); or
 2. A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130° F (54.4° C) regardless of the pressure at 70° F (21.1° C); or
 3. A liquid having a vapor pressure exceeding 40 psi at 100° F (37.8° C) as determined by ASTM D-323-72.
- H. "Designated area" means an area which may be used for work with "select carcinogens," reproductive toxins or substances which have a high degree of acute toxicity. A designated area may be the entire laboratory, an area of a laboratory or a device such as a laboratory hood.
- I. "Emergency" means any occurrence such as, but not limited to, equipment failure, rupture of containers or failure of control equipment which results in an uncontrolled release of a hazardous chemical into the workplace.
- J. "Employee" means an individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments.
- K. "Explosive" means a chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.
- L. "Flammable" means a chemical that falls into one of the following categories:
1. "Aerosol, flammable" means an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame protection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;
 2. "Gas, flammable" means:
 - a. A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13 percent by volume or less; or

- b. A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12 percent by volume, regardless of the lower limit.
3. "Liquid, flammable" means any liquid having a flashpoint below 100° F (37.8° C), except any mixture having components with flashpoints of 100° C or higher, the total of which make up 99 percent or more of the total volume of the mixture.
4. "Solid, flammable" means a solid, other than a blasting agent or explosive as defined in 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.
- M. "Flashpoint" means the minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows:
1. Tagliabue Closed Tester (See American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24 -1979 (ASTM D 56-79)) - for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100° F (37.8° C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or
 2. Pensky-Martens Closed Tester (See American National Standard Method of Test for Flashpoint by Pensky-Martens Closed Tester, Z11.7 - 1979 (ASTM D 93-79)) - for liquids with a viscosity equal to or greater than 45 SUS at 100° F (37.8° C), or that contain suspended solids, or that have a tendency to form a surface film under test; or
 3. Setaflash Closed Tester (see American National Standard Method of test for Hash Point by Setaflash Closed Tester (ASTM D 3278-78)).
- * *Organic peroxides, which undergo autoaccelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above.*
- N. "Hazardous chemical" means a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems, and agents which damage the lungs, skin, eyes, or mucous membranes.
1. Appendices A and B of the Hazard Communication Standard (29 CFR 1910.1200) provide further guidance in defining the scope of health hazards and determining whether or not a chemical is to be considered hazardous for purposes of this standard.
- O. "Laboratory" means a facility where the "laboratory use of hazardous chemicals" occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

- P. "Laboratory scale" means work with 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 scale" excludes those workplaces whose function is to produce commercial quantities of materials.
- Q. "Laboratory-type hood" means a device located in a laboratory, enclosure on five sides with a movable sash or fixed partial enclosed on the remaining side; constructed and maintained to draw air from the laboratory and to prevent or minimize the escape of air contaminants into the laboratory; and allows chemical manipulations to be conducted in the enclosure without insertion of any portion of the employee's body other than hands and arms.
1. Walk-in hoods with adjustable sashes meet the above definition provided that the sashes are adjusted during use so that the airflow and the exhaust of air contaminants are not compromised and employees do not work inside the enclosure during the release of airborne hazardous chemicals.
- R. "Laboratory use of hazardous chemicals" means handling or use of such chemicals in which all of 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 a 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.
- S. "Medical consultation" means a consultation which takes place between an employee and a licensed physician for the purpose of determining what medical examinations or procedures, if any, are appropriate in cases where a significant exposure to a hazardous chemical may have taken place. T. "Organic peroxide" means an organic compound that contains the bivalent -O-O- structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical. U. "Oxidizer" means a chemical other than a blasting agent or explosive as defined in 1910.109(a), that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases. V. "Physical hazard" means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive. W. "Protective laboratory practices and equipment" means those laboratory procedures, practices and equipment accepted by 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.
- X. "Reproductive toxins" means chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

Y. "Select carcinogen" means any substance which meets one of the following criteria:

- 1. It is regulated by OSHA as a carcinogen; or**
- 2. It is listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP)(latest edition); or**
- 3. It is listed under Group 1 ("carcinogenic to humans") by the International Agency for research on Cancer Monographs (IARC)(latest editions); or**
- 4. It is listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:**
 - a. After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m(3);**
 - b. After repeated skin application of less than 300 (mg/kg of body weight) per week; or**
 - c. After oral dosages of less than 50 mg/kg of body weight per day.**

Z. "Unstable (reactive)" means a chemical which is the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature.

AA."Water-reactive" means a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

IQ. Permissible exposure limits: For laboratory uses of OSHA regulated substances, the employer shall assure that laboratory employees' exposures to such substances do not exceed the permissible exposure limits specified in 29 CFR part 1910, subpart Z.

IV. Employee exposure determination:

- A. Initial monitoring. The employer shall measure the employee's exposure to any substance regulated by a standard which requires monitoring if there is reason to believe that exposure levels for that substance routinely exceed the action level (or in the absence of an action level, the PEL).**
- B. Periodic monitoring. If the initial monitoring prescribed by paragraph IV A of this section discloses employee exposure over the action level (or in the absence of an action level, the PEL), the employer shall immediately comply with the exposure monitoring provisions of the relevant standard.**
- C. Termination of monitoring. Monitoring may be terminated in accordance with the relevant standard.**
- D. Employee notification of monitoring results. The employer shall, within 15 working days after the receipt of any monitoring results, notify the employee of these results in writing either individually or by posting results in an appropriate location that is accessible to employees.**

V. Chemical hygiene plan - General. (Appendix A of this section is non-mandatory but provides guidance to assist employers in the development of the Chemical Hygiene Plan).

- A. Where hazardous chemicals as defined by this standard are used in the workplace, the employer shall develop and carry out the provisions of a written Chemical Hygiene Plan which is:**
 - 1. Capable of protecting employees from health hazards associated with hazardous chemicals in that laboratory, and;**
 - 2. Capable of keeping exposures below the limits specified in paragraph UJ of this section.**
- B. The Chemical Hygiene Plan shall be readily available to employees, employee representatives and, upon request, to the Assistant Secretary.**
- C. The Chemical Hygiene Plan shall include each of the following elements and shall indicate specific measures that the employer will take to ensure laboratory employee protection;**
 - 1. Standard operating procedures relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals;**
 - 2. Criteria that the employer will use to determine and implement control measures to reduce employee exposure to hazardous chemicals including engineering controls, the use of personal protective equipment and hygiene practices; particular attention shall be given to the selection of control measures for chemicals that are known to be extremely hazardous;**
 - 3. A requirement that fume hoods and other protective equipment are functioning properly and specific measures that shall be taken to ensure proper and adequate performance of such equipment;**
 - 4. Provisions for employee information and training as prescribed in paragraph VI of this section;**
 - 5. The circumstances under which a particular laboratory operation, procedure or activity shall require prior approval from the employer or the employer's designee before implementation;**
 - 6. Provisions for medical consultation and medical examinations in accordance with paragraph VTH of this section;**
 - 7. Designation of personnel responsible for implementation of the Chemical Hygiene Plan including the assignment of a Chemical Hygiene Officer, and, if appropriate, establishment of a Chemical Hygiene Committee; and**
 - 8. Provisions for additional employee protection for work with particularly hazardous substances. These include "select carcinogens," reproductive toxins and substances which have a high degree of acute toxicity. Specific consideration shall be given to the following provisions which shall be included where appropriate:**
 - a. Establishment of a designated area;**
 - b. Use of containment devices such as fume hoods or glove boxes;**
 - c. Procedures for safe removal of contaminated waste; and**
 - d. Decontamination procedures.**
- D. The employer shall review and evaluate the effectiveness of the Chemical Hygiene Plan at least annually and update it as necessary.**

VI. Employee information and training.

- A. The employer shall provide employees with information and training to ensure that they are apprised of the hazards of chemicals present in their work area.**
- B. Such information shall be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations. The frequency of refresher information and training shall be determined by the employer.**
- C. Information. Employees shall be informed of:**
 - 1. The contents of this standard and its appendices which shall be made available to employees;**
 - 2. The location and availability of the employer's Chemical Hygiene Plan;**
 - 3. The permissible exposure limits for OSHA regulated substances or recommended exposure limits for other hazardous chemicals where there is no applicable OSHA standard;**
 - 4. Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory; and**
 - 5. The location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including, but not limited to, Material Safety Data Sheets received from the chemical supplier.**
- D. Training.**
 - 1. Employee training shall include:**
 - a. Methods and observations that may be used to detect the presence or release of a hazardous chemical (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);**
 - b. The physical and health hazards of chemicals in the work area; and**
 - c. The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.**
 - 2. The employee shall be trained on the applicable details of the employer's written Chemical Hygiene Plan.**

VII. Medical consultation and medical examinations.

- A. The employer shall provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances:**

1. Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory, the employee shall be provided an opportunity to receive an appropriate medical examination.
 2. Where exposure monitoring reveals an exposure level routinely above the action level (or in the absence of an action level, the PEL) for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements, medical surveillance shall be established for the affected employee as prescribed by the particular standard.
 3. Whenever an event takes place in the work area such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure, the affected employee shall be provided an opportunity for a medical consultation. Such consultation shall be for the purpose of determining the need for a medical examination.
- B. All medical examinations and consultations shall be performed by or under the direct supervision of a licensed physician and shall be provided without cost to the employee, without loss of pay and at a reasonable time and place.**
- C. Information provided to the physician. The employer shall provide the following information to the physician:**
1. The 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; and
 3. A description of the signs and symptoms of exposure that the employee is experiencing, if any.
- D. Physician's written opinion.**
1. For examination or consultation required under this standard, the employer shall obtain a written opinion from the examining physician which shall include the following:
 - a. Any recommendation for further medical follow-up;
 - b. The results of the medical examination and any associated tests;
 - c. Any medical condition which may be revealed in the course of the examination which may place the employee at increased risk as a result of exposure to a hazardous workplace; and
 - d. A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment.
 2. The written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure.

Vm. Hazard identification.

- A. With respect to labels and material safety data sheets:**

1. Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced.
2. Employers shall maintain any material safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible to laboratory employees.

B. The following provisions shall apply to chemical substances developed in the laboratory:

1. If the composition of the chemical substance which is produced exclusively for the laboratory's use is known, the employer shall determine if it is a hazardous chemical as defined in paragraph II of this section. If the chemical is determined to be hazardous, the employer shall provide appropriate training as required under paragraph VI of this section.
2. If the chemical produced is a byproduct whose composition is not known, the employer shall assume that the substance is hazardous and shall implement paragraph V of this section.
3. If the chemical substance is produced for another user outside of the laboratory, the employer shall comply with the Hazard Communication Standard (29 CFR 1910.1200) including the requirements for preparation of material safety data sheets and labeling.

DC. Use of respirators. Where the use of respirators is necessary to maintain exposure below permissible exposure limits, the employer shall provide, at no cost to the employee, the proper respiratory equipment. Respirators shall be selected and used in accordance with the requirements of 29 CFR 1910.134.

X. Recordkeeping.

- A. The employer shall establish and maintain for each employee an accurate record of any measurements taken to monitor employee exposures and any medical consultation and examinations including tests or written opinions required by this standard.
- B. The employer shall assure that such records are kept, transferred, and made available in accordance with 29 CFR 1910.1020.

XL Dates.

- A. **Effective date.** This section shall become effective May 1,1990.
- B. **Start-updates.**
 1. Employers shall have developed and implemented a written Chemical Hygiene Plan no later than January 31,1991.
 2. Paragraph IB of this section shall not take effect until the employer has developed and implemented a written Chemical Hygiene Plan.

XJJ. Appendices. The information contained in the appendices is not intended, by itself, to create any additional obligations not otherwise imposed or to detract from any existing obligation.

A Incompatible with

Alkali and alkaline earth
Carbides Hydrides
Hydroxides Metals
Oxides Peroxides

Azides, inorganic

Cyanides, inorganic

Nitrates, inorganic

Organic compounds

- Organic acyl halides

- Organic anhydrides

Organic halogen compounds

Organic nitro compounds

B

Water
Acids
Halogenated organic compounds
Halogenating agents
Oxidizing agents

Acids
Heavy metals and their salts
Oxidizing agents

Acids Strong
bases

Acids Reducing
agents

Oxidizing agents
Bases
Organic hydroxy and amino compounds

Bases
Organic hydroxy and amino compounds

Group LA and HA metals
Aluminum

Strong bases

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INCOMPATIBLE CHEMICALS

Oxidizing agents

- Chlorates
- Chromates
- Chromium trioxide
- Dichromates
- Halogens
- Hydrogen peroxide
- Nitric acid
- Nitrates
- Perchlorates
- Peroxides
- Permanganates
- Persulfates

Reducing agents

Sulfides, inorganic

Reducing agents

Ammonia, anhydrous and aqueous
Carbon
Metals
Metal hydrides
Nitrites
Organic compounds
Phosphorous
Silicon
Sulfur

Oxidizing agents

Arsenates
Arsenites
Phosphorous
Selenites
Selenates
Tellurium salts and oxides

Acids

RULES FOR STORING CHEMICALS SAFELY

1. Segregate all incompatible chemicals for proper storage of chemicals for hazard class codes. In other words, store like chemicals together and away from other groups of chemicals that might cause reactions if mixed. Do not simply store chemicals in alphabetical order (see #3 below).
2. Flammable materials should be stored in an approved, dedicated, flammable materials storage cabinet or room if the volume exceeds ten (10) gallons.
3. Chemicals shall be stored separately from non-compatible hazard classes. A suggested storage pattern is included on this page.
4. Liquids should be stored in unbreakable or double-contained packaging, or the storage cabinet should have the capacity to hold the contents if the container breaks.
5. Avoid floor chemical storage (even temporary).
6. Chemicals should be stored no higher than eye level and never on the top shelf of a storage unit.
7. Shelf assemblies should be firmly secured to the walls. Avoid island shelves.
8. Each shelf should have an anti-roll lip or door.
9. Store acids in a dedicated acid cabinet. Nitric acid may be stored there also, if it is kept isolated from the others.
10. Store severe poisons in a dedicated poison cabinet.
11. All chemicals should be labeled and dated.
12. Look for unusual conditions in chemical storage areas, such as:
 - improper storage of chemicals
 - leaking or deteriorating containers
 - spilled chemicals
 - temperature extremes (too hot or cold in storage area)
 - lack of or low lighting
 - levels blocked exits or aisles
 - doors blocked open, lack of security
 - trash accumulation
 - smoking or open lights or matches
 - fire equipment blocked, broken or missing
 - lack of information or warning signs ("No Smoking", "Flammable Liquids", "Acids", "Corrosives", "Poisons", "Chemical Storage")

Any of these conditions should be corrected immediately. Inspections of chemical storage areas on a routine basis will help to correct deficiencies and prevent accidents.

Suggested chemical storage pattern

INORGANIC	ORGANIC
Sulfur, Phosphorus, Arsenic, Phosphorus Pentoxide	Alcohols, Glycols, etc. (store flammables in dedicated cabinets)
Halides, Sulfates, Sulfites, Thiosulfates Phosphates, etc.	Hydrocarbons, Esters, etc. (store flammables in dedicated cabinet)
Amides, Nitrates (not ammonium nitrate), Nitrites, etc.	Ethers, Ketones, etc. (store flammables in dedicated cabinet)
Metals, Hydrides (store away from water)	Epoxy compounds, Isocyanates
Hydroxides, Oxides, Silicates, etc.	Sulfides, Polysulfides, etc.
Arsenates, Cyanides (store above acids)	Phenol, Cresols
Sulfides, Selenides, Phosphides, Carbides, Nitrides	Peroxides, Azides, etc.
Manganates, Chromates, Permanganates, Borates	Acids, Anhydrides, Peracids, etc.
Chlorates, Chlorites, Perchlorates, Peroxides, Perchloric acid	Miscellaneous
Acids, except nitric (store acids in dedicated cabinets)	Miscellaneous (Nitric Acid)

Suggested storage time limits

For common peroxidizable compounds

MOST DANGEROUS: Discard after 3 months.

Peroxide formation hazard during storage.

isopropyl ether
divinyl acetylene
vinylidene chloride
potassium metal
sodium amide

DANGEROUS: Discard after one year.

Peroxide formation hazard during storage and on concentration (i.e. distillation) of compound.

Diethyl ether	Tetrahydrofuran
Dioxane	Acetal
Methyl isobutyl ketone	Ethylene glycol dimethyl ether
Vinyl ethers	Dicyclopentadiene
Diacetylene	Methyl acetylene
Cumene	Tetrahydronaphthalene
Cyclohexene	Methylcyclopentane

DANGEROUS: Discard after one year. Peroxide

formation causes initiation of hazardous polymerization.

Methyl methacrylate	Vinyl acetylene
Styrene	Vinyl acetate
Acrylic acid	Vinyl chloride
Acrylonitrile	Vinyl pyridine
Butadiene	Chloroprene
Tetrafluoroethylene	

Safety Hints:

1. Do not purchase these compounds in quantities greater than can be used in the specified storage time period.
2. Ethers should be stored in the dark and under nitrogen if possible.
3. Always check for the presence of peroxides before distilling any peroxide former.
4. Consult safety references before working with peroxidizable compounds.

Short list of incompatible materials

DO NOT CONTACT

ACETIC ACID with: chromic acid, nitric acid, hydroxyl containing compounds, ethylene glycol, perchloric acid, peroxides, and permanganates.	ALKALI METALS such as calcium, potassium, and sodium with: water, carbon dioxide, carbon tetrachloride, and other chlorinated hydrocarbons.
ACETONE with: concentrated sulfuric acid and nitric acid mixtures.	ACETYLENE with: copper (tubing), fluorine, bromine, chlorine, iodine, silver, mercury, or their compounds.
AMMONIA, ANHYDROUS with: mercury, halogens, calcium hypochlorite, or hydrogen fluoride.	AMMONIUM NITRATE with: acids, metal powders, flammable liquids, chlorates, nitrates, sulfur, and finely divided organics or other combustibles.
ANILINE with: nitric acid, hydrogen peroxide, or other strong oxidizing substances.	BROMINE with: ammonia, acetylene, butadiene, butane, hydrogen, sodium carbide, turpentine, or finely divided metals.
CHLORATES with: ammonium salts, acids, metal powders, sulfur, carbon, finely divided organics or other combustibles.	CHROMIC ACID with: acetic acid, naphthalene, camphor, alcohol, glycerine, turpentine, and other flammable liquids.
CHLORINE with: ammonia, acetylene, butadiene, benzene and other petroleum fractions, hydrogen, sodium carbides, turpentine, and finely divided metals.	CYANIDES with: acids.
HYDROGEN PEROXIDE with: copper, chromium, iron, most metals or their respective salts, flammable liquids and other combustible materials, aniline, and nitromethane.	HYDROGEN SULFIDE with: nitric acid, oxidizing gases.
HYDROCARBONS generally, with: fluorine, chlorine, bromine, chromic acid, or sodium peroxide.	IODINE with: acetylene or ammonia.

MERCURY with: acetylene, fluminic acid, or hydrogen.	NITRIC ACID with: acetic, chromic, or hydrocyanic acids, aniline, carbon, hydrogen sulfide, flammable liquids or gases, or other substances which are readily nitrated.
OXYGEN with: oils greases, hydrogen, flammable liquids, solids, or gases.	OXALIC ACID with: silver or mercury
PERCHLORIC ACID with: acetic anhydride, bismuth and its alloys, alcohol, paper, wood, and other organic materials.	PHOSPHOROUS PENTOXBDE with: water.
POTASSIUM PERMANGANATE with: glycerine, ethylene glycol, benzaldehyde, or sulfuric acid.	SODIUM PEROXIDE with: any oxidizable substances, for instance: methanol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerine, ethylene glycol, ethyl acetate, fiufural, etc.
SULFURIC ACID with: chlorates, perchlorates, permanganates, and water	

NOTE: This list is not a complete list of incompatible materials. It contains some of the more common incompatible materials. Always research the materials you work with in order to be safe.

Chemical	Effects
Sulfur dioxide	Extremely toxic, severe burns to lungs
Carbon disulfide	Irritates skin, eyes, nose, respiratory tract; high concentrations affect nervous system causing unconsciousness and even death
Nitrogen	Can asphyxiate because it reduces oxygen in air; termed "asphyxiating gas"
Carbon tetrachloride	Damaging to liver even at exposure level with no discernible odor
Hydrogen cyanide	Absorbed through skin easily; most rapidly acting of all known poisons
Hydrogen sulfide	Can desensitize sense of smell and irritate respiratory tract; concentrations above 700 ppm cause breathing to stop
Carbon monoxide	Prevents oxygenation of blood
Nitric acid	Can produce lung edema, eventually suffocating victim from fluid accumulation
Trichloroacetic acid	Severely caustic; respiratory tract irritant
Acetic acid	Severely caustic; chronic exposure to vapor can lead to chronic bronchitis
Benzidine	Absorbed rapidly through skin; salts can cause cancer
Phenol	Corrosive to skin; contact dermatitis even from dilute solutions
Ethers	Depression of central nervous system
Benzene	Acts on bone marrow to destroy production of blood cells associated with some leukemias
Dryice/C02	In closed space can cause asphyxiation; extreme cold can injure skin

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CHEMICAL CARCINOGENS, MUTAGENS AND TERATOGENS

Acrylonitrile

Methyl chloromethyl ether

beta-Propiolactone

N-Nitrosodimethylamine

Asbestos

4-Aminodiphenyl

(2-chloroaniline)

Nitroso guanidine

Osmium Tetraoxide

Ethyl nitroso urea

Ethyleneimine

4-Dimethylaminoazobenzene

alpha-Naphthylamine

Vinyl chloride

Benzidine

Coke oven emissions

Ethidium bromide and

other complex aromatics

Dimethyl sulfate

Nucleoside analogs

(e.g., amino purine)

4-Nitrobiphenyl

bis-Chloromethyl ether (and salts)

2-Acetylaminofluorene

beta-Naphthylamine

Benzene

1,2-Dibromo-3 chloropropane (DBCP)

Hydrazine

Acridine orange Alkylating

agents (ethyl methane

sulfonate)

LABORATORY INSPECTION GUIDELINES AND FORM

The following guide has been developed to assist you in your scheduled safety surveillance of laboratories and departments under your auspices as lab supervisor. This guide is by no means all encompassing, however information contained after each item should assist you in determining whether your area may be in full, partial or non-compliance.

Keep in mind that all Federal, State and Southwest Tennessee Community College rules, recommendations and regulations determine the compliance of our area concerning OSHA, EPA, NIH, CDC, and DOT. If you have any specific questions on the information below, please contact Southwest's Safety Department at (901) 333-5459.

1. Entrances, Exits, Hallways and Stairways - All entrances, exits, hallways and stairways must be clear and unobstructed.
2. Showers/Eye Wash Operative - Monthly inspections are required. Any area which deals with corrosive, flammable or otherwise hazardous material is required to have immediate access to eyewash and drench shower facilities. All showers and eye wash equipment must be in full operational order and unobstructed. Eye wash bottles are not adequate equipment.
3. Personal Protective Equipment - Personal Protective Equipment such as goggles, masks, gloves and cover gowns must be readily available and not worn outside the immediate work areas. Lab coats and appropriate shoes shall be worn to avoid any contact with harmful materials. Respirators shall be used when applicable. Evidence of respirator training and certification must be readily available.
4. Fire Extinguisher/Inspection and Location - All fire extinguishers must be inspected annually. Extinguishers must be properly mounted, unobstructed and be properly labeled for the intended use. Training classes are offered through the Southwest Safety Department.
5. Pressurized Cylinders - All cylinders must be stored in proper locations. All cylinders must be secured in an upright position and properly restrained to prevent falling. Containers must be labeled for contents and usage. Maximum number of cylinders of a flammable gas shall be not more than 3 (10" x 50") per 500 square feet in an unsprinkled space or not more than 6 (10" x 50") in a sprinkled space of 500 square feet. Liquefied gas cylinders in laboratory work areas shall not exceed 3 cylinders (9" x 30") in a sprinkled space or exceed 2 cylinders (9" x 30") in an unsprinkled space.
6. Room Use Identification - All access doors must be marked when rooms or areas are being used for chemical, biological or radioactive purposes as outlined in the Southwest Chemical Hygiene Plan. All doors must remain closed and the vision panel must remain unobstructed. Unattended labs shall be locked at all times.
7. UL Electrical Equipment and Cords - Only Underwriters Laboratories approved equipment and cords are authorized for use. Only UL listed multiple outlet strips equipped with 15 AMP circuit breakers are approved.

8. **Fume Hood Operation - Face Velocities** should be between 80 and 150 FPM at the working sash height with an optimum level of 100 FPM. The sash should never be higher than 12 inches except when accessing equipment. Hoods should not be located in high traffic areas or under air supply vents. The hood must have user spill protection and cup sinks must have spill guards.
9. **Biological Safety Cabinets - Certification** is required annually or any time the hood is moved or has had maintenance performed. Cabinets must not be located near high traffic areas or air supply ducts.
10. **Hazardous Chemicals - All chemicals** must be appropriately labeled and shall not be placed near or over floor drains. Flammable liquids must be stored in appropriate containers. There should be no more than 5 gallons of solvents or Class IA or IB flammables out in the lab per 100 sq. ft. No more than 10 gallons should be in specific storage cabinets per 100 sq. ft. For larger storage capacities and long-term storage of flammables and solvents an approved storage area should be used.
11. **Hazardous Waste Disposal - Hazardous waste training** is required for all employees who handle hazardous material. The Safety and Health Department will co-ordinate training. A certification of training must be posted in laboratories.
12. **Equipment and Utility Labeling - Refrigerators, ice machines and microwaves** must be labeled for intended use. Food, personal medication and hazardous materials shall not be housed in the same refrigerator. All utility and plumbing lines need to be labeled and indicate the product contained; i.e., gas, water, etc.
13. **Location of Cut-off Valves/Circuit Breakers - All cut off valves and breakers** must be properly labeled.
14. **General Safety (Dress, Eating, Smoking, etc.) - Eating, drinking, smoking and applying cosmetics** is not permitted in a wet lab. Lab personnel shall not wear loose clothing (e.g. saris, dangling neckties, overly large or ragged lab coats), skimpy clothing (e.g. shorts and/or halter-tops), torn clothing, or unrestrained long hair. Perforated shoes, sandals, or cloth sneakers are not to be worn in labs.
15. **Use of Flame and Heat - No heat generating devices** should be left unattended.
16. **Ventilation - Airflow in most labs** should be "negative" with respect to the corridor. Laboratory doors shall be kept closed when laboratory procedures are in progress. Volatile hazardous materials shall not be used on the open bench top.
17. **Housekeeping/Drains Flushed - All unnecessary material, boxes, and containers** must be disposed of in the appropriate manner. All drains, including floor drains and cup sinks should be flushed with water on a weekly basis to eliminate sewer odors. Proper housekeeping must be maintained to provide adequate clearance of sprinkler systems and emergency equipment.

- 18. Sharps (Glass, Scalpel, Blades, Syringes, Etc.) - All sharps, needles and glass must be disposed of in an approved, labeled container. Glass containers and other potentially sharp objects shall not be disposed of in common office refuse. Containers must not be overfilled and must be labeled and sealed for proper handling and disposal.**
- 19. Emergency lighting - Where necessary, emergency lighting units shall be properly mounted and unobstructed. If emergency lighting exists, it should be checked periodically to ensure it is functional.**
- 20. Emergency Plans/Posted Numbers - All emergency and contingency plans and evacuation routes shall be clearly posted in conspicuous places. A list of emergency numbers and contacts must be kept updated and posted along side the emergency plans.**
- 21. Safety Manuals - Manuals must be current and readily available for all employees.**
- 22. Accidents Reported/Investigated - All accidents must be reported to the immediate supervisor for the completion of the appropriate form. File copies of reported incidents and accidents must be on hand, as well as the action taken to alleviate the safety hazard in the future.**
- 23. Safety Training - This area is designated for lab safety training which is required by law.**

DATE:

AREA:

Chemical Hygiene for Laboratories Checklist	YES	NO	N/A
Lab staff, supervisors, and faculty know where the Southwest written CHP is kept for their area, have received required training, know the name of their safety chairperson and how to contact their department's safety chairperson?			
Completed CHP awareness certificates are on file in the departments?			
Written Emergency Procedures in place and understood by the lab staff?			
Are chemicals NOT stored on the floor? Are containers of liquids stored at eye level or below?			
Is glass apparatus that is under pressure or vacuum either taped or caged?			
Is unobstructed access available to eyewashes and safety showers available from the workstations?			
Are PPE and engineering controls, such as fume hoods, operating properly?			
Are gas cylinders secured, and are incompatible gases stored separately?			
Are rooms or areas designated for use of SPECIAL HEALTH HAZARDS labeled?			
Is every laboratory door posted with names and phone numbers of responsible personnel to be contacted in case of emergency?			

Chemical Waste Management Checklist	YES	NO	N/A
Does this location generate hazardous wastes?			
Are wastes stored in a designated area and segregated according to their compatibilities and physical characteristics? (Guidelines -Table 1)			
Are waste containers correctly labeled with the words HAZARDOUS WASTE and with the container ingredients?			
Are waste containers and waste collection containers tightly capped or closed?			
Are containers not leaking and safe for transportation?			
Is the volume of waste stored less than 50 gallons or 1 quart of acutely toxic waste? (Guidelines - Attachment 1)			
Are MSDSs available for waste trade/brand name products?			

Environmental Health Checklist	YES	NO	N/A
Are employees exposed to biohazardous agents? (bacteria, fungus, parasites, toxins)			
Have employees been provided with a copy of the Southwest Safety Manual and appropriately trained in the hazards of exposure?			
Have employees been made aware of signs and symptoms associated with exposure to Biohazards in their work area?			
Do employees understand the principles of safe lab practices? (PPE, handling, labeling, and storage of biohazardous agents)			
Do employees know what to do in the event of a biohazardous agent exposure, such as a puncture, cut, splash or inhalation?			
Does the location generate biohazardous wastes?			
Are personnel familiar with Purdue's Infectious Waste Disposal Program and Completion of the Bio-Materials Pick-Up and Treatment Certification Form?			
Are biohazardous wastes chemically or physically treated and are biohazardous wastes labeled and stored in a designated area in appropriate bags?			

Bloodborne Pathogens	YES	NO	N/A
Are employees exposed to human blood, human blood products, or human tissue?			
Are these employees given annual required bloodborne pathogen training and do they understand the concept of universal precautions?			
Are these employees given the opportunity to receive, at no cost to them, hepatitis B vaccinations?			
Are blood products or tissue specimens disinfected, labeled and disposed of properly?			

COMMENTS OR ISSUES FOR FOLLOW-UP:

General Safety Checklist	YES	NO	N/A
Housekeeping			
Are the aisles clear and at least three feet wide? Are stairs well lit?			
Are floors free of oil, grease, liquids, broken and uneven surfaces, or sharp objects?			
Is all trash placed in proper containers? Is it disposed of properly? (examples: sharps, used toner, empty chemical containers, broken glass)			
Are materials stored so they don't stick out, and can't fall?			
Machinery and Equipment			
Are machine guards in place and in use?			
Are electrical cords not frayed and do outlets match? Are outlets not overloaded?			
Are ladders in good condition and suited for the job?			
Personal Protective Clothing and Equipment			
Have hazard assessments been completed and made readily available for the tasks?			
Is PPE readily available to protect against area hazards?			
Have employees been trained on correct use, care, donning and doffing of PPE, and are training records available?			
Emergency Protection			
Are fire extinguishers unobstructed?			
Are the fire exits unobstructed and identified?			
Are non-exit doors identified?			
Are sprinkler heads unobstructed? (at least 18" clearance surrounding the head)			

COMMENTS OR ISSUES FOR FOLLOW-UP:

HAZARD RATING INFORMATION FOR NFPA FIRE DIAMONDS

This appendix provides hazard-rating information for many common chemicals. You may wish to use labels that include the NFPA fire diamond. Use this reference to complete the health, fire, reactivity, and special notice areas in the diamond. An explanation of the hazard rating system is given below.

Health (Blue Diamond)	
0	No chemical is without some degree of toxicity.
1	Slightly toxic material. May cause irritation, but only minor residual injury even without treatment. Recognized innocuous materials when used with responsible care.
2	Moderately toxic material. Intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical treatment is given.
3	Seriously toxic material. Short term exposure could cause serious temporary or residual injury even though prompt medical treatment is given. Includes known or suspect small animal carcinogens, mutagens or teratogens.
4	Highly toxic material. Very limited exposure could cause death or major injury even though prompt medical treatment is given. Includes known or suspect human carcinogens, mutagens or teratogens.

Flammability (Red Diamond)	
0	Materials that will not burn.
1	Slightly combustible. Materials that require considerable preheating before ignition can occur. This rating includes most ordinary combustible materials.
2	Combustible. Materials that must be moderately heated before ignition can occur. Including liquids having a flash point above 100 degrees F, and solids that readily give off flammable vapors.
3	Flammable. Liquids and solids that can be ignited under almost all ambient temperature conditions. Including liquids with a flash point below 73 degrees F and a boiling point above 100 degrees F, solid materials which form coarse dusts that burn rapidly without becoming explosive, materials which burn rapidly by reason of self-contained oxygen (i.e. organic peroxides), and materials which ignite spontaneously when exposed to air.
4	Extremely flammable. Materials that will rapidly vaporize at normal pressure and temperature and will burn readily. Including: gases, cryogenic materials, any liquid or gaseous material having a flash point below 73 degrees F and a boiling point below 100 degrees F, and materials which can form explosive mixtures with air.

Reactivity (Yellow Diamond)	
0	Materials that are normally stable, even under fire conditions, and which are not reactive with water.
1	Materials which are normally stable, but which can become unstable at elevated temperatures and pressures, or which may react with water with some release of energy, but not violently.
2	Materials that in themselves are normally unstable and readily undergo violent chemical change, but do not detonate. It includes materials which may react violently with water or which may form potentially explosive mixtures with water.
3	Materials which in themselves are capable of detonation but which require a strong initiating source, or which must be heated first. This rating includes materials which are shock sensitive at elevated temperatures, and which react explosively with water without requiring heat

Special Notice (White Diamond)	
OX	Denotes materials that are oxidizing agents. These compounds give up oxygen easily, remove hydrogen from other compounds or attract negative electrons.
W	Denotes materials that are water reactive. These compounds undergo rapid energy releases on contact with water.

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HAZARD RATING INFORMATION FOR NFPA FIRE DIAMONDS

Compound	Health	Fire	Reactivity	0
Acetal	2	3	0	
Acetaldehyde	2	4	2	
Acetic Acid (glacial)	2	2	2	
Acetic Anhydride	3	2	2	
Acetone	1	3	0	
Acetonitrile	2	3	0	
Acetophenone	1	2	0	
Acetyl Chloride	3	3	2	
Acetylene	1	4	3	
Acetyl Peroxide	1	2	4	
Acrolein	3	3	2	
Acrolein Dimer	1	2	1	
Acrylic Acid (glacial)	3	2	2	
Acrylonitrile	4	3	2	
Adipic Acid	-	1	0	
Adiponitrile	4	2	0	
Aldol	3	2	1	
Allyl Acetate	1	3	0	
Allyl Alcohol	3	3		
Allyl Bromide	3	3	0	
Allyl Chloride	3	3	1	
Aluminum (dust or powder)	0	1		
3-Aminopropanol	3	2	1	
Ammonia, Anhydrous	3	1		
Ammonium Bromide	2	0	1	
Ammonium Chloride	2	0	0	
Ammonium Fluoride	3	0	0	
Ammonium Nitrate	2	0	0	
Ammonium Perchlorate	2	0	0	
Ammonium Permanganate	2	0	0	
Ammonium Sulfate	3	0	3	
Amyl Acetate	1	3	4	
Amyl Alcohol	1	3	3	
Amylamine	3	3	0	
Amylbenzene	1	2	0	
Amyl Chloride	1	3	0	
Amyl Ether	1	2	0	
Amyl Maleate	0	1	0	
Amyl Nitrate	2	2	0	
o-Amyl Phenol	2	1	0	
Amyl Propionate	0	2	0	
Amyl Stearate	0	1	0	
Amyl Toluene	2	2	0	
Aniline	3	2	0	

S/N

OX
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HAZARD RATING INFORMATION FOR NFPA FIRE DIAMONDS

Compound	Health	Fire	Reactivity	<i>SIN</i>
o-Anisidine	2	1	0	
Anisole	1	2	0	
Antimony Pentafluoride	3	0	1	
Antimony Pentasulfide	3	1	1	
Arsenic Chloride	3	0	0	
Arsenic Trisulfide	3	1	0	
Barium Chlorate	1	0	2	OX
Barium Nitrate	1	0	0	OX
Barium Peroxide	1	0	0	OX
Benzaldehyde	2	2	0	
Benzoic Acid	2	1	-	
Benzol (benzene)	2	3	0	
Benzotrifluoride	4	3	0	
Benzoyl Chloride	3	2	1	W
Benzyl Acetate	1	1	0	
Benzyl Alcohol	2	1	0	
Benzyl Cyanide	2	1	0	
Benzyl Salicylate	1	1	0	
Beryllium (dust or powder)	4	1	0	
Biphenyl	2	1	0	
Boron Trifluoride	3	0	1	
Bromine	4	0	0	OX
Bromine Trifluoride	4	0	3	OX W
Bromobenzene	2	2	0	
o-Bromotoluene	2	2	0	
Butadiene Monoxide	2	3	2	
Butane	1	4	0	
1-Butane	1	4	0	
Butenediol	1	1	0	
Butyl Acetate	1	3	0	
Butyl Acetoacetate	1	2	0	
Butyl Acrylate	2	2	2	
Butyl Alcohol	1	3	0	
Butylamine	2	3	0	
Butylamine Oleate	3	2	0	
Butylbenzene	2	2	0	
Butyl Benzoate	1	1	0	
Butyl Bromide	2	3	0	
Butyl Chloride	2	3	0	
Butylcyclohexane	0	-	0	
Butyldecalin	1	1	0	
Butyl Formate	2	3	0	
N-Butyl Isocyanate	3	2	2	
Butyl Isovalerate	0	-	-	

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HAZARD RATING INFORMATION FOR NFPA FIRE DIAMONDS

Compound	Health	Fire	Reactivity	S/N
Butyl Lactate Butyl	1	2	0	
Methacrylate Butyl	2	2	0	
Naphthalene Butyl	1	1	0	
Nitrate Butyl	1	3	3	
Oxalate Butyl	0	1	0	
Propionate Butyl	2	3	0	
Stearate Butyl	1	1	0	
Trichlorosilane	2	2	0	
Butyraldehyde	2	3	0	
Butyraldol	2	2	0	
Butyraldoxime	2	2	0	
Butyric Acid	2	2	0	
Calcium Carbide	1	4	2	W
Calcium Chlorate	2	0	2	OX
Calcium Cyanide	3	0	0	
Calcium Hypochlorite	2	0	2	OX
Calcium Oxide	1	0	1	
Camphor Caproic	0	2	0	
Acid Capryladehyde	2	1	0	
Caprylyl Chloride	2	2	0	
Carbon Disulfide	3	2	1	
Carbon Monoxide	2	3	0	
Carbon Tetrachloride	2	4	0	
Castor Oil Chlorine	3	0	0	
Chlorine Monoxide	0	1	0	
Chloroacetic Acid	3	0	0	OX
Chloroaceto Phenone	3	4	3	
Chlorobenzene	3	1	0	
Chloroform	2	1	0	
Chloropicrin	2	3	0	
Chlorotoluene	2	0	0	
Chromic Acid Citral	4	0	3	
Cobalt Naphtha	2	2	0	
Coconut Oil	3	0	1	OX
Cod Liver Oil	0	2	0	
Corn Oil	1	2	0	
Creosote Oil o-	0	1	0	
Cresol	0	1	0	
Crotonaldehyde	0	1	0	
Crotonic Acid	2	2	0	
Crotononitrile	3	2	0	
	3	3	2	
	3	2	0	
	-	1	0	

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Compound	Health	Fire	Reactivity	S/N
Cumene	2	3	0	
Cupric Nitrate	1	0	0	OX
Cyanogen	4	4	2	
Cyanogen Bromide	3	0	2	
Cyclobutane		4	0	
Cyclohexane		3	0	
Cyclohexanol		2	0	
Cyclohexanone		2	0	
Cyclohexene		3	0	
Cyclohexenone		3	0	
Cyclohexyl Chloride	2	3	0	
Cyclopentane		3	0	
Cyclopentene		3	1	
Cyclopentanone	2	3	0	
Cyclopropane	1	4	0	
Decaborane	3	2	1	
Decane	0	2	0	
Decanol	0	2	0	
1-Decene	0	2	0	
Decylamine	2	1	0	
Dehydroacetic Acid	1	1	0	
Denatured Alcohol	0	3	0	
Deuterium	0	4	0	
Diacetone Alcohol	1	2	0	
Diamyl Sulfide	2	2	0	
Dibenzoyl Peroxide	1	4	4	OX
Diborane	3	4	3	W
Dibutylamine	3	2	0	
Dibutyl Ether	2	3	0	
Dibutyl Oxalate	0	1	0	
Dibutyl Phosphite	3	2	0	
Dibutyl Phthalate	0	1	0	
o-Dichlorobenzene	2	2	0	
1,2-Dichlorobutane	2	2	0	
1,1 -Dichloroethene	2	4	2	
1,2-Dichloroethylene	2	3	2	
Dichlorosilane	3	4	2	
Didecyl Ether	0	1	0	
Diesel Fuel Oil No. 1	0	2	0	
Diethylamine	2	3	0	
Diethylene Glycol Dimethyl Ether	1	2	1	
Diethylene Triamine	3	1	0	
Diethyl Fumarate	1	1	0	
Diethyl Ketone	1	3	0	

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Compound	Health	Fire	Reactivity	S/N
Diethyl Succinate	1	1	0	
Diethyl Sulfate	3	1	1	
Diethylzinc	0	3	3	W
Dihexylamine	2	1	0	
Diisobutylamine	3	3	0	
Diisobutyl Carbinol	1	2	0	
Diisobutyl Ketone	1	2	0	
Diisooctyl Phthalate	0	1	0	
Diisopropylamine	3	3	0	
Diisopropyl Benzene	0	2	0	
Diketene	2	2	2	
Dimethylamine	3	4	0	
N, N-Dimethylaniline	3	2	0	
2,2-Dimethylbutane	1	3	0	
Dimethyldioxane	2	3	0	
N, N-Dimethylformamide	1	2	0	
Dimethyl Maleate	1	1	0	
2,3-Dimethyloctane	0	2	0	
2,3-Dimethylpentane	0	3	0	
Dimethyl Phthalate	0	1	0	
Dimethyl Sulfate	4	2	0	
dimethyl Sulfide	2	4	0	
Dimethyl Sulfoxide	1	1	0	
Dinitrobenzene (ortho)	3	1	4	
2,4-Dinitrotoluene	3	1	3	
Diethyl Ether	0	1	0	
p-Dioxane	2	3	1	
Dioxolane	2	3	2	
Dipentene	0	2	0	
Diphenylamine	3	1	0	
Diphenyl Phthalate	0	1	0	
Dipropylamine	3	3	0	
Divinylbenzene	2	2	2	
Divinyl Ether	2	3	2	
Dodecane	0	2	0	
1-Dodecanethiol	2	1	0	
1-Dodecanol	0	1	0	
Endrin (dry)	2	0	0	
Epichlorohydrin	3	2	1	
Ethane	1	4	0	
Ethanolamine	2	2	0	
Ethoxybenzene	0	2	0	
3-Ethoxypropanal	2	2	0	
Ethyl Acetate	1	3	0	

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HAZARD RATING INFORMATION FOR NFPA FIRE DIAMONDS

Compound	Health	Fire	Reactivity	S/N
Ethyl Acrylate	2	3	2	
Ethyl Alcohol	0	3	0	
Ethylamine	3	4	0	
Ethylbenzene	2	3	0	
Ethyl Benzoate	1	1	0	
Ethyl Borate	2	3	0	
Ethyl Bromide	2	1	0	
Ethylbutylamine	3	3	0	
Ethyl Butyl Carbonate	2	2	1	
Ethyl Butyl Ketone	1	2	0	
Ethyl Butyrate	0	3	0	
Ethyl Caprylate	2	2	0	
Ethyl Chloride	2	4	0	
Ethyl Crotonate	2	3	0	
Ethylcyclohexane	1	3	0	
Ethylene	1	4	2	
Ethylenediamine	3	2	0	
Ethylene Dichloride	2	3	0	
Ethylene Glycol	1	1	0	
Ethylene Glycol Dibutyl Ether	1	2	0	
Ethylene Glycol Ethylbutyl Ether	1	2	0	
Ethylene Glycol Monobutyl Ether Acetate	1	2	0	
Ethylene Oxide	2	4	3	
Ethyl Ether	2	4	1	
Ethyl Formate	2	3	0	
Ethyl Isobutyrate	0	3	0	
Ethyl Mercaptan	2	4	0	
4-Ethylmorpholine	2	3	0	
Ethyl Nitrate	2	3	4	
Ethyl Oxalate	0	2	0	
Ethyl Propionate	-	3	0	
Ethyl Silicate	2	2	0	
Fluorine	4	0	3	W,OX
Formaldehyde (water solution)	2	2	0	
Formamide	2	1		
Formic Acid	3	2	0	
Furan	1	4	1	
Furfuryl Alcohol	1	2	1	
Gas, Natural	1	4	0	
Gasoline 56-100 Octane	1	3	0	
Glycerine	1	1	0	
Glycidyl Acrylate	0	2	0	
Heptane	1	3	0	
2-Heptanol	0	2	0	

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HAZARD RATING INFORMATION FOR NFPA FIRE DIAMONDS

Compound	Health	Fire	Reactivity
Heptylene	0	3	0
Hexadecane	0	1	0
Hexanal	2	3	1
Hexane	1	3	0
3-Hexanone	1	3	0
1-Hexene	1	3	0
Hexyl Alcohol	1	2	0
Hexyl Methacrylate	0	2	0
Hydrazine (Anhydrous)	3	3	2
Hydrocyanic Acid-96%	4	4	2
Hydrogen	0	4	0
Hydrochloric Acid	3	0	0
Hydrobromic Acid	3	0	0
Hydrofluoric Acid	4	0	0
Hydrogen Peroxide (35% to 52% by weight)	2	0	1
Hydrogen Sulfide	3	4	0
Hydroquinone	2	1	
Isoamyl Acetate	1	3	0
Isoamyl Alcohol	1	2	
Isobutane	1	4	0
Isobutyl Acetate	1	3	
Isobutyl Acrylate	1	3	0
Isobutyl Alcohol	1	3	
Isobutylbenzene	2	2	0
Isobutyl Chloride	2	3	
Isobutyl Methyl Ketone	2	3	0
Isobutyraldehyde	2	3	1
Isobutyric Acid	1	2	0
Isobutyric Anhydride	1	2	
Isodecaldehyde	0	2	0
Isodecanoic Acid	0	1	
Isohexane	1	3	0
Isooctane	0	3	
Isooctanoic Acid	0	1	0
Isooctyl Alcohol	0	2	1
Isopentane	1	4	0
Isophorone	2	2	1
Isoprene	2	4	0
Isopropyl Acetate	1	3	0
Isopropyl Alcohol	1	3	0
Isopropyl Chloride	2	4	0
Isopropyl Ether	2	3	0
Jet Fuels (JP-4)	1	3	0
Jet Fuels (JP-5)	0	2	

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HAZARD RATING INFORMATION FOR NFPA FIRE DIAMONDS

Compound	Health	Fire	Reactivity	S/N
Lanolin	0	1	0	
Lead Arsenates	2	0	0	
Lead Nitrate	1	0	0	OX
Lead Thiocyanate	1	1	1	
Lithium	1	1	2	w
Lithium Hydride	3	4	2	w
Lubricating Oil, Mineral	0	1	0	
Magnesium (including all alloys)	0	1	2	w
Magnesium Nitrate	1	0	0	OX
Magnesium Perchlorate	1	0	0	OX
Maleic Anhydride	3	1	1	
Mercuric Cyanide	3	0	0	
Mesityl Oxide	3	3	0	
Methacrylic Acid	3	2	2	
Methane	1	4	0	
Methyl Acetate	1	3	0	
Methyl Acrylate	2	3	2	
Methylal	2	3	2	
Methyl Alcohol	1	3	0	
Methylamine	3	4	0	
Methyl Amyl Ketone	1	2	0	
Methyl Benzoate	0	2	0	
Methyl Borate	2	3	1	
Methyl Bromide	3	1	0	
Methyl Butyl Ketone	2	3	0	
Methyl Carbonate	2	3	1	
Methyl Cellosolve Acetate	0	2	0	
Methyl Chloride	2	4	0	
Methyl Chloroacetate	2	2	1	
Methylcyclohexane	2	3	0	
Methylcyclohexanone	-	2	0	
Methylcyclopentane	2	3	0	
Methylene Chloride	3	1	1	
Methylene Diisocyanate	1	2	1	w
Methyl Ether	2	4	1	
Methyl Ethyl Ether	2	4	1	
Methyl Ethyl Ketone	1	3	0	
Methyl Formate	2	4	0	
Methyl Glycol Acetate	1	2	0	
Methyl Hexyl Ketone	0	2	0	
Methylhydrazine	3	3	2	
Methyl Isoamyl Ketone	1	2	0	
Methyl Isobutyl Carbinol	2	2	0	
Methyl Isobutyl Ketone	2	3	0	

SOUTHWEST

TENNESSEE COMMUNITY COLLEGE

HAZARD RATING INFORMATION FOR NFPA FIRE DIAMONDS

Compound	Health	Fire	Reactivity	S/N
Methyl Isocyanate	2	3	3	W
Methyl Lactate	1	2	0	
Methyl Mercaptan	2	4	0	
Methyl Methacrylate	2	3	2	
Methyl Parathion (solid)	4	1	2	
2-Methyl-1-Pentene	1	3	0	
Methyl Phenylacetate	0	2	0	
1-Methyl Piperazine	2	2	0	
Methyl Propionate	1	3	0	
Methyl Propyl Ketone	2	3	0	
2-Methylpyrazine	2	2	0	
Methylpyrrole	2	3	1	
Methylpyrrolidine	2	3	1	
Methyl Salicylate	1	1	0	
Methyl Stearate	0	1	0	
Methyl Toluene Sulfonate	2	1	0	
Methyl Vinyl Ketone	3	3	2	
Mineral Oil	0	1	0	
Mineral Spirits	0	2	0	
Morpholine	2	3	0	
Mustard Oil	3	2	0	
Naptha	1	3	0	
Napthalene	2	2	0	
Nickel Carbonyl	4	3	3	
Nicotine	4	1	0	
Nitric Acid	3	0	0	OX
p-Nitroaniline	3	1	3	
Nitrobenzene	3	2	0	
Nitrobiphenyl	2	1	0	
Nitrochlorobenzene	3	1	1	
Nitroethane	1	3	3	
Nitrogen (liquified)	3	0	0	
Nitrogen Peroxide	3	0	0	OX
Nitrogen Trioxide	3	0	0	OX
Nitroglycerine	2	2	4	
Nitromethane	1	3	3	
1-Nitropropane	1	3	1	
o-Nitrotoluene	2	1	4	
Nonadecane	0	1	0	
Nonane	0	3	0	
Nonene	0	3	0	
Nonylbenzene	0	1	0	
Octadecane	0	1	0	
Octane	0	3	0	

SOUTHWEST

TENNESSEE COMMUNITY COLLEGE

HAZARD RATING INFORMATION FOR NFPA FIRE DIAMONDS

Compound	Health	Fire	Reactivity	S/N
2-Octanol	1	2	0	
1-Octene	1	3	0	
Oleic Acid	0	1	0	
Olive Oil	0	1	0	
Oxalic Acid	2	1	0	
Oxygen (liquid)	3	0	0	OX
Paraffin Oil	0	1	0	
Paraformaldehyde	2	1	0	
Paraldehyde	2	3	1	
Parathion	4	1	2	
Pentaborane	3	3	2	
Pentachlorophenol (dry)	3	0	0	
Pentane	1	4	0	
Pentanoic acid	2	1	0	
Pentaphen	2	1	0	
1-Pentene	1	4	0	
Perchloric Acid	3	0	3	OX
Perchloroethylene	2	0	0	
Petroleum, Crude	1	3	0	
Petroleum Ether	1	4	0	
Phenol	3	2	0	
Phenylacetaldehyde	1	2	0	
Phenyl Acetate	1	2	0	
Phenylacetic Acid	1	1	0	
o-Phenylenediamine	-	1	0	
Phenylhydrazine	3	2	0	
Phenylpropyl Alcohol	0	1	0	
Phosgene	4	0	0	
Phosphine	3	4	1	
Phosphoric Acid	2	0	0	
Phosphorus Pentasulfide	3	1	2	W
Phosphorus, Red	0	1	1	
Phosphorus Trichloride	3	0	2	W
Phosphorus, White or Yellow	3	3	1	
Phosphoryl Chloride	3	0	2	W
Phthalic Acid	0	1	1	
Phthalic Anhydride	2	1	0	
Picric Acid	2	4	4	
Pine Oil	0	2	0	
Pine Tar	0	2	0	
Piperazine	2	2	0	
Piperidine	2	3	3	
Potassium	3	1	2	W
Potassium Bromate	1	0	0	OX

SOUTHWEST

TENNESSEE COMMUNITY COUEGE

HAZARD RATING INFORMATION FOR NFPA FIRE DIAMONDS

Compound	H	Fire	Reactivity	S/N
Potassium Chlorate	2	0	0	OX
Potassium Cyanide	3	0	0	
Potassium Hydroxide (lye)	3	0	1	
Potassium Nitrate	1	0	0	OX
Potassium Permanganate	1	0	0	OX
Potassium Peroxide	3	0	2	W OX
Potassium Persulfate	1	0	0	OX
Potassium Sulfide	2	1	0	
Propane	1	4	0	
Propionic Acid	2	2	0	
Propionyl Chloride	3	3	1	
Propyl Acetate	1	3	0	
Propyl Alcohol	1	3	0	
Propylamine	3	3	0	
Propyl Chloride	2	3	0	
Propylene	1	4	1	
Propylene Dichloride	2	3	0	
Propylene glycol	0	1	0	
Propylene Oxide	2	4	2	
n-Propyl Ether	-	3	0	
Propyl Nitrate	2	4	3	OX
Pyridine	2	3	0	
Pyrrole	2	2	0	
Pyrrolidine	2	3	1	
Quinoline	2	1	0	
Resorcinol	-	1	0	
Rhodinol	0	1	0	
Salicylic Acid	0	1	0	
Silane	1	4	2	
Silver Nitrate	1	0	0	
Sodium	3	1	2	OX Tur
Sodium Chlorate	1	0	2	OX
Sodium Chlorite	1	1	2	OX
Sodium Cyanide	3	0	0	
Sodium Fluoride	2	0	0	
Sodium Hydride	3	3	2	W
Sodium Hydroxide (lye)	3	0	1	
Sodium Nitrate	1	0	0	OX
Sodium Perchlorate	2	0	2	OX
Sodium Peroxide	3	0	2	OX W
Sodium-Potassium Alloys	3	3	2	W
Sodium Sulfide	2	1	0	
Stannic Chloride	3	0	1	
Stearic Acid	1	1	0	

SOUTHWEST

TENNESSEE COMMUNITY COLLEGE

HAZARD RATING INFORMATION FOR NFPA FIRE DIAMONDS

Compound	Health	Fire	Reactivity	S/T
Stearyl Alcohol	0	-	0	
Stoddard Solvent	0	2	0	
Styrene	2	3	2	
Sulfur	2	1	0	
Sulfur Chloride	2	1	2	inr
Sulfur Dioxide	2	0	0	
Sulfuric Acid	3	0	2	w
Tannic Acid	0	1	0	
Terephthaloyl Chloride	3	1	0	
Tetachlorobenzene	0	10	0	
Tetrachloroethylene	2	0	0	
Tetradecanol	0	1	0	
Tetraethylene Glycol	1	1	0	
Tetraethyl Lead, Compounds	3	2	3	
Tetrafluoroethylene	3	4	3	
Tetrahydrofuran	2	3	1	
Tetramethyl Lead, Compounds	3	3	3	
Thionyl Chloride	3	0	2	w
Thiophene	2	3	0	
Titanium Tetrachloride	3	0	1	
Toluene	2	3	0	
Toluene-2,4-Diisocyanate	3	1	1	
o-Toluidine	3	2	0	
Triamylamine	2	1	0	
Triamylbenzene	0	1	0	
Tributylamine	2	2	0	
Tributyl Phosphate	2	1	0	
Tributylphosphine	0	1	0	
Tributyl Phosphite	2	1	1	
1,1,1-Trichloroethane	2	1	0	
Trichloroethylene	2	1	0	
Trichloroethylsilane	3	3	0	
Trichlorosilane	3	4	2	w
Triethanolamine	2	1	1	
Triethylamine	2	3	0	
Triethyl Phosphate	0	1	1	
Triisobutyl Borate	3	2	1	
Trimethylamine	2	4	0	
Trimethylchlorosilane	3	3	2	w
Trinitrobenzene	2	4	4	
Trinitrotoluene (tot)	2	4	4	
Trioxane	2	2	0	
Triphenylmethane	0	1	0	
Tripropylene	0	3	0	

SOUTHWEST

TENNESSEE COMMUNITY COLLEGE

HAZARD RATING INFORMATION FOR NFPA FIRE DIAMONDS

Compound	Health	Fire	Reactivity	S/N
Tripropylene Glycol	0	1	0	
Turpentine	1	3	0	
2-Undecanol	1	1	0	
Valeraldehyde	1	3	0	
Vanadium Tetrachloride	3	0	2	W
Vinyl Acetate	2	3	2	
Vinyl Bromide	2	0	1	
Vinyl Butyl Ether	2	3	2	
Vinyl Chloride	2	4	1	
Vinyl Crotonate	2	3	2	
Vinyl Ethyl Alcohol	0	2	0	
Vinyl Ethyl Ether	2	4	2	
Vinyl Fluoride	1	4	2	
Vinylidene Chloride	2	4	2	
Vinylidene fluoride	1	4	2	
Vinyl Methyl Ether	2	4	2	
Vinyl Propionate	2	3	2	
Vinyl Toluene	2	2	1	
o-Xylene	2	3	0	
o-Xylidine	3	1	0	
Zinc (powder or dust)	0	1	1	
Zinc Chlorate	2	0	2	OX
Zirconium Tetrachloride	3	0	1	

The following are examples of waste treatment technologies or practices:

Biological treatment: usually involves treatment of waste by bacteria, fungi, or algae to remove and degrade the hazardous constituents.

Boiler: is a type of device that can be used to treat hazardous waste. Boilers use controlled flame combustion and recover thermal energy in the form of steam or heated gases.

Carbon adsorption: uses activated carbon to adsorb hazardous waste constituents. Gaseous and aqueous waste streams can be treated by carbon adsorption.

Chemical oxidation: uses strong oxidizing agents (e.g. hypochlorite, peroxides, persulfates, perchlorates, permanganates, etc) to break down hazardous waste constituents to render them less toxic or mobile.

Chemical reduction: uses strong reducing agents (e.g. sulfur dioxide, alkali salts, sulfides, iron salts, etc) to break down hazardous waste constituents to render them less toxic or mobile.

Deactivation: is a process that removes the hazardous nature of the waste by neutralizing the characteristics of ignitability, corrosivity, and/or reactivity.

Extraction: is a process that removes hazardous constituents from either gaseous or liquid waste streams by means of settling, filtration, adsorption, absorption, solvents, or other means. Although the extracted hazardous constituents are removed from the waste stream, they usually must be treated further to render them less toxic.

Incineration: is the high temperature burning (rapid oxidation) of a waste, usually at 1600 to 2500 degrees F. It is also known as controlled-flame combustion or calcination and is a technology that destroys organic constituents in waste materials.

Industrial Furnace: is a type of hazardous waste treatment device that uses thermal energy to recover energy or materials. It includes cement kilns, lime kilns, aggregate kilns, phosphate kilns, coke ovens, blast furnaces, smelting furnaces, etc.

Microencapsulation: is a process that coats the surface of the waste material with a thin layer of plastic or resin to prevent the material from leaching hazardous waste constituents.

Neutralization: is a process that is used to treat corrosive hazardous waste streams. Low pH acidic corrosive waste streams are usually neutralized by containing bases. High pH corrosive waste streams are usually neutralized by adding acids.

Physical removal: is a process that removes the hazardous constituents from waste streams by separation techniques such as ion exchange, adsorption, reverse osmosis, chelation, solvent extraction, crystallization, precipitation, distillation, filtration, evaporation, etc. The removed hazardous constituents may require further treatment to make them less toxic.

Smelting: is a technology that uses high temperature heating to recover metals from waste streams (e.g. lead, zinc).

Stabilization: is a process that reduces the mobility of the hazardous constituents of a waste or that makes the waste easier to handle. The most common stabilization agents added to waste streams are Portland cement, lime, fly ash, and cement kiln dust.

Steam stripping: is a treatment technology that is usually used to remove organic compounds from liquid waste streams. The process involves direct application of steam to the liquid and subsequent condensation of the extracted organic compounds. Steam stripping not only removes hazardous constituents from the waste stream but it also can have the added benefit of making the constituents less toxic.

SOUTHWEST

TENNESSEE COMMUNITY COLLEGE

Treatment in tanks: mechanical settling, gravity settling, chemical oxidation, and neutralization are examples of hazardous waste treatment technologies that are allowed to take place in tanks by RCRA. Thermal treatment in tanks is not generally allowed by RCRA unless the facility obtains a disposal or combustion permit.

Vitrification: is a process that uses high temperatures to melt hazardous waste into molten glass.

Subsequent cooling of molten glass material results in solid blocks of material which are resistant to leaching hazardous constituents.

Wastewater treatment units: are tanks that are part of a wastewater treatment facility that are used to treat or store hazardous wastewater or wastewater sludge.

Waste to Energy Incineration: is a technology that is usually associated with municipal waste combustion where the waste is burned at a high temperature. Heat energy is recovered from the combustion process and is usually used to generate steam and or electricity.

SOUTHWEST

TENNESSEE COMMUNITY COLLEGE

SUPERVISORS' SAFETY CHECKLIST: CHEMICAL SAFETY

Supervisor _____

Date _____

Department/Area _____

YES	NO	CHECKLIST AREA
Area Safety Check		
		Containers are the proper type for this chemical
		No open top or glass containers
		Containers have proper hazard labels
		Bonding and grounding straps for bulk flammable containers
		Incompatible chemicals are stored separately
		Flammable and highly-flammable chemicals are stored in approved lockers
		Access to hazardous chemicals is controlled
		Eyewash and emergency showers are available in chemical use areas
		Eyewash and emergency showers operate properly
Employee Work Actions		
		Workers have access to and use Material Safety Data Sheets
		Minimum amount of chemicals are used at workstations
		Spills are cleaned up or reported immediately
Employee Training - workers have been trained in:		
		Specific chemical hazards
		Proper disposal
		PPE use and limitations
		Use of eyewash and emergency showers

Page ___ of.

Date of Inventory:

Department:

Building: _____

_Area: _____

Person doing inventory:

CHEMICAL NAME	COMMON NAME	MANUFACTURER	QUANTITY ON HAND	MSDS ON FILE?
1.				
2.				
3.				
4.				
5.				
6.				
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11.				
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