West Texas A&M University™

ACADEMIC RESEARCH ENVIRONMENTAL HEALTH AND SAFETY

**STANDARD OPERATING PROCEDURES**

**SOP No. 24.01.99.W1.48AR WTAMU Chemical Inventory**

Approved: October 1, 2014

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Environmental Health and Safety at WTAMU is composed of two distinct but integrated environmental safety departments that report to the Vice President of Research and Compliance. Academic and Research Environmental Health and Safety (AR-EHS) is responsible for research and academic related compliance, which includes laboratory and academic research and the associated compliance committees. Fire and Life Safety (FLS-EHS) is responsible for fire related compliance and conducts fire and life safety inspections of campus buildings and assists with the testing all fire detection and suppression systems.

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## PURPOSE

In order to comply with numerous regulatory requirements, including the Hazard Communication Regulation – CFR 1910.1200 (Haz Com), West Texas A & M University (WTAMU) produces an annual chemical inventory identifying the location (building and room) and quantity of all institutional research hazardous materials. An on-line inventory software system, MSDSOnline, is used to support chemical tracking in the fulfillment of all regulatory requirements. Hazard Communication Regulation – CFR 1910.1200 (HazCom) was created to ensure that the hazards of chemicals produced or imported are evaluated, and that appropriate hazard information is transmitted to employers and employees. Other chemical regulations and guidelines, that require chemical reporting and inventory include:

- Environmental Protection Agency (EPA) – Emergency and Planning Community Right-to-Know Act (EPCRA) hazardous chemical storage reporting
- Department of Homeland Security (DHS) – Chemicals of Interest (COI)
- Centers for Disease Control and Prevention (CDC) – Select agents and toxins
- Drug Enforcement Agency (DEA) – Controlled Substances and List I and II regulated chemicals
- International Building Code – Flammable material and other storage limits
- National Fire Protection Association (NFPA) codes and standards – Flammable material and other chemical storage limits
- City and County Ordinances regarding flammable material and other chemical storage limits
- Veterans Administration (VA) – mandated inventory reconciliation every 6 months for VA funded research

A system for maintaining an accurate inventory of laboratory or facility chemicals is essential for compliance with local, state, and federal regulations as well as building codes and standards. Additional benefits of conducting routine chemical inventories include:

- Ensures chemicals are stored according to compatibility tables
- Eliminates unneeded or outdated chemicals
- Increases the ability to locate and share chemicals in emergency situations
- Verifies accurate hazard warning signage on laboratory doorways
- Promotes more efficient use of laboratory space
- Verifies expiration dates on peroxide forming chemicals
- Ensures integrity of shelving and storage
- Encourages laboratory principal investigators (PIs) to make decisions regarding old or unneeded chemicals or chemical containers
- Evaluates torn or missing labels and damaged chemical containers and lids/caps
- Ensures compliance with federal, state, and local record-keeping requirements
- Promotes good relations and a sense of trust with the community and emergency responders
- Reduces the risk of exposure to hazardous materials and ensures a clean and healthy laboratory environment
- Reduces costs through chemical re-use, redistribution, and recycling

Each laboratory should maintain appropriate safety data sheets (SDS) in the laboratory SDS binder. Additionally, SDS are readily available online on MSDSOnline. Academic and Research Environmental Health and Safety (AR-EHS) staff will ensure each chemical delivered to a laboratory are accompanied by a SDS for the on-site SDS binder as well as update the online inventory on MSDSOnline. A chemical inventory should be conducted at least annually, but may be conducted at the request of the laboratory PI, Department Head, Dean, or Vice President for Risk and Compliance.

## Scope

### Inventory Requirements

Each research laboratory of facility at WTAMU will work in conjunction with AR-EHS and the PI/subject matter expert to inventory all items listed in the "items to be inventoried" below.

All hazardous and non-hazardous chemicals must be procured through AR-EHS. Use the online chemical ordering form to place chemical orders. Upon receipt, AR-EHS will conduct a review of the chemical hazards and risks and procure the material. Upon arrival, AR-EHS will enter the chemical into the MSDSOnline chemical inventory and deliver the chemical and physical SDS to the laboratory identified on the chemical ordering form. AR-EHS should notify the PI of the chemical delivery by verbal or written communication.

Annually, AR-EHS will conduct a chemical inventory to verify the inventories listed on MSDSOnline match what is found in the laboratory and other storage areas. For those materials requiring additional chemical review, such as controlled substances, those reviews and inventories will be conducted per the most recent version of the regulatory requirements. Such reviews may be necessary to prevent:

- Release: quantities of toxic, flammable, or explosive materials that have the potential to create significant adverse consequences for human life or health if intentionally or unintentionally released, detonated or involved in a fire.
- Theft of diversion: materials that have the potential, if stolen or diverted, to be abused or used as weapons, which can ultimately lead to significant adverse consequences for human life or health.
- Sabotage or contamination: chemicals that, if mixed together or with other materials, have the potential to create significant adverse consequences for human health or life.

### Items Required to be Inventoried

Any, but not limited to, chemical containers that have a manufacture's label which denotes physical or health hazards, or whose SDS denotes hazards, are to be included in the inventory. In general, laboratory chemicals (hazardous & non-hazardous) and reagents are inventoried even if the hazard is considered low. Chemicals received from chemical manufacturers such as Sigma- Aldrich, Fluka, Alfa Aesar, Fisher Scientific, Mallinckrodt Baker, Acros, Bio-Rad, Qiagen, Invitrogen, etc., will be included in the lab inventory. The list below provides some examples of common materials that need to be inventoried.

- DHS Chemicals of Interest
    - https://www.dhs.gov/xlibrary/assets/chemsec_appendixa-chemicalofinterestlist.pdf
- DEA scheduled materials
    - https://www.deadiversion.usdoj.gov/schedules/index.html
- Select agents classified as biological toxins
- All flammable solvents to include primary and secondary containers brought in from separate locations

- 10 gallon carboy of ethanol which was filled from a primary drum and brought into the laboratory
- Materials transferred from another lab
- All organic solvents
    - Including liquid scintillation counting cocktail
- Research drugs or therapeutics
- All chemical/reagents regardless of hazard class, lab personnel will need to adjust the levels of non-hazardous chemical/reagents to reflect the max amounts indicated for the space
- Shock sensitive and potentially explosive mixtures produced by the lab must be inventoried (example, Bouin's stain made from saturated picric acid solution or serial dilution of ether mixtures)
    - For further guidance in peroxide forming materials and shock sensitive materials, see the sections of this standard operating procedure listed below.
        - Reactive or explosive materials requiring special attention
        - Guidelines for safe handling and disposal of peroxide forming materials
- Lecture cylinders, small compressed gas cylinders or small propane cylinders
- Corrosive cleaning agents (e.g. strong base/acid solutions, RNASE away, Chromerge, etc.)
- Materials used for maintenance, repair, or cleaning (e.g. bleach, mineral spirits, oils, lubricants and greases including vacuum pump fluid)
- Photographic Chemicals
- Activated charcoal
- Chemical kits
    - Chemicals contained in the kits are not individual inventoried. They are inventoried under the kit name.
- Dyes and stains
- Biological material (e.g.)
    - plant or animal tissue, blood or blood products
    - reproducing biological organisms, bacteria, viruses, fungi or yeast
    - Enzymes, antibodies, proteins, peptides, nucleic acids
    - Conjugated antibodies and proteins

## Items not Required to be Inventoried

Even though some items may not be entered into the inventory, the user is still responsible to obtain a current SDS for the product. The list below provides some examples of common materials that do not need to be inventoried.

- Any secondary chemical container that is produced in the lab from a primary chemical container(s) that is already inventoried (e.g.)
    - 1N NaOH made from commercially available 10N NaOH solution or solid NAOH
    - Squirt bottles and spray bottles
    - Conical "Falcon" tubes with chemicals or samples in them
- Tissue culture media or other growth media
- Buffer solutions for pH probes
- Non-chemical diagnostic materials that contain a film on any surface (e.g. 96-well plate)
- Chemical spill kits
- First aid kit (may include calcium gluconate as a first aid for hydrofluoric acid burns)
- Food or food additives (unless it will be used for R&D or operational purposes)
- Office Supplies (appropriate quantities for office administrative purposes)
- Non-Hazardous metals such as foils, bars, and rods
- Test strips (pH, peroxide, water hardness, iron, phosphate, etc.)

Note: Each PI or designated person(s) will be responsible for the proper hazard determination for all mixtures that are commonly made and used in the research lab. For hazard classification guidance concerning mixtures and solutions, the Hazard Communication Standard (29 CFR 1910.1200) states that a mixture (or solution) will be considered as having the same health hazards as the components that comprise ≥1% of the mixture (≥0.1% for known carcinogens in the mixture). If the PI or designated person(s) is not comfortable with making hazard determinations or is unsure about the hazard classification of a particular solution, they should consult with AR-EHS.

## Acquisition of Chemicals

Chemical inventories are maintained by AR-EHS. Please review the SOP 24.01.01.W1.31AR WTAMU Chemical Procurement Procedure for specifics.

- The purchase, transfer or use of any chemical not on the existing inventory for the laboratory space must have prior approval from the laboratory PI prior to purchase or use
- Before any hazardous material is used, information regarding the proper handling, storage, and disposal will be made available to those who have potential exposure.
    - PI has ultimate responsibility
    - AR-EHS provides SDS documentation upon delivery and will provide SDS documentation upon request
- All chemicals are procured through AR-EHS.
    - Use the online chemical ordering form when requesting chemicals
- Contact AR-EHS via telephone at 651.4261 or via email at ar-ehs@wtamu.edu prior to relocating chemicals
- All chemicals are delivered to AR-EHS where the chemicals are inventoried in MSDSOnline, reviewed for safety, provided SDS documentation, and finally delivered to the identified location on campus for storage and use
- Annual chemical inventories of each lab are conducted by AR-EHS. The laboratory PI may conduct the inventory and provide the results to AR-EHS if preferred. All areas which store or use chemicals are included in the annual inventories
- Some chemicals may have a barcode affixed to the container. Laboratory personnel can remove the chemical inventory barcode from the chemical container and place on the inventory barcode form located near the storage area within the laboratory. These barcodes are from an older tracking system so newer chemicals will not have these barcodes.
- AR-EHS collects empty containers and reviews the barcode forms upon request but not less than quarterly

## Non-Compliance of Acquisition of Chemicals

AR-EHS receives all chemical packages from Central Receiving. If procurement has been placed without going through AR-EHS then AR-EHS will contact the PI to remind them of the procedure. The reminder may include language addressing the appropriate purchasing process. AR-EHS may assign additional training through the Purchasing office. If a second occurrence happens then AR-EHS may contact the PI, department head, dean, and Vice President of Risk and Compliance and request suspension of Procard privileges for 30 days. If a third occurrence happens then AR-EHS may request Purchasing to cancel Procard permanently.

## Removing Chemicals from the Laboratory

AR-EHS will conduct an annual physical chemical inspections and will work with laboratory PIs to determine if chemicals are expired, unwanted, or unused. An electronic inventory may be sent to the PI for review. AR-EHS will work with the PI to schedule removal of expired, unwanted, or

unused chemicals. If the PI seeks to keep expired chemicals, the PI may do so as long as there are no known hazards associated with the long term storage and use of the specific chemical.

- Any work involving humans or animals as research subjects are excluded from this section
    - Chemicals must not be expired

## Chemical Handling

Important information about handling chemicals can be found in the SDS. A comprehensive file of MSDSs/SDSs should be kept in the laboratory. Trained laboratory personnel should always:

- Read and heed the label and the SDS before using a chemical for the first time
- Understand and appropriately utilize the personal protection equipment (PPE) that must be worn when handling the chemical
- Ensure that ventilation is adequate for the chemical's usage in the laboratory
- Understand and enforce the institutional Chemical Hygiene Plan, and all associated safe laboratory practices, so that appropriate actions are taken in the event of a chemical spill, fire, or explosion

## Materials Requiring Special Attention

### Reactive or Explosive Compounds

Occasionally, it is necessary to handle materials known to be explosive or which may contain explosive impurities such as peroxides. Because mechanical shock, elevated temperature, or chemical action might result in explosion with forces that release large volumes of gases, heat, and often toxic vapors, such reactive or explosive compounds must be treated with special care. The proper handling of highly energetic substances without injury demands strict attention to detail. The unusual nature of work involving such substances requires special safety measures and handling techniques which must be understood thoroughly and followed by all persons involved. The practices listed in this section are a guide for use in any laboratory operation including explosive materials in the chemical inventory. However, additional information should be sought from the SDS.

Work with explosive (or potentially explosive) materials generally requires the use of special protective apparel (e.g., face shields, gloves, and laboratory coats) and protective devices such as explosion shields, barriers, enclosed barricades, or isolation rooms with blowout roof or windows.

- An explosion occurs when a material undergoes a rapid reaction that results in a violent release of energy. Such reactions can happen spontaneously or be initiated and can produce pressures, gases, and fumes that are hazardous. Highly reactive and explosive materials used in the laboratory require appropriate procedures.

### Particularly Hazardous Substances

A list of Particularly Hazardous Substances (PHS's) is provided to help comply with the Hazardous Chemicals in Laboratory Standard (Code of Federal Regulations, Title 29, and Part 1910.1450). These chemicals may present extreme risk potential to laboratory workers if not handled appropriately; therefore, these substances may require additional control measures when used. It is important to note that the list should not be considered "all inclusive". Many other chemicals that are not listed may also possess extremely hazardous properties. Laboratory PI's are responsible for assessing the hazards of chemical materials that they may use or synthesize, and to take appropriate steps to implement safety controls. Contact AR-EHS for specific questions regarding safety processes available for working with hazardous substances.

Hazardous Chemicals in Laboratories Standard (29 CFR 1910.1450) defines particularly hazardous substances (PHSs) as including the following categories or chemicals:

- Select Carcinogens are those listed by OSHA, the International Agency for Research on Cancer (IARC), or the National Toxicology Program (NTP) as known or suspected human carcinogens.
- Reproductive toxins are chemicals that may adversely affect male and female reproductive health and/or the developing fetus.
- Chemicals having high acute toxicity are those that have oral, inhalation, or dermal LC50 and LD50 values below specified thresholds listed in the OSHA Hazcom Standard (29 CFR 1910.1200). Oral exposures are not considered a high risk in the laboratories so chemicals toxic only by the oral route are not included in the WTAMU PHS list. The toxicity thresholds are as follows:
    - Dermal LD50 (albino rabbits) ≤ 200 mg/kg
    - Inhalation LC50 (albino rats) ≤ 200 ppm vapor or gas or ≤2 mg/l dust or fume
- Reactive chemicals include explosives, flammable solids, peroxide formers, oxidizers, and compounds that are reactive with air or water.

## Storage Groups

To lessen risk of exposure to hazardous chemicals, trained laboratory personnel should separate and store all chemicals according to hazard category and compatibility. In the event of an accident involving a broken container or a chemical spill, incompatible chemicals that are stored in close proximity can mix to produce fires, hazardous fumes, and explosions. Laboratory personnel should read the SDS and heed the precautions regarding the storage requirements of the chemicals in the laboratory. AR-EHS provides chemical compatibility tables to each laboratory and chemical storage space.

To avoid accidents, all chemical containers must be properly labeled with the full chemical name, not abbreviations, using a permanent marker. All transfer vessels should have the following label information:

- Chemical name (required)
- Hazard warnings (required)
- Name of manufacturer
- Name of PI
- Date of transfer to vessel (required)

Incoming chemical shipments should be dated promptly upon receipt and chemical stock should be rotated to ensure use of older chemicals. It is good practice to date peroxide formers upon receipt and date again when the container is opened so that the user can dispose of the material according to the recommendations on the SDS. Peroxide formers should be stored away from heat and light in sealed airtight containers with tight fitting, nonmetal lids. Test regularly for peroxides and discard the material prior to the expiration date.

When storing chemicals on open shelves, always use sturdy shelves which are secured to the wall and are equipped with 0.75 inch lips. Please comply with the following:

- Do not store liquid chemicals higher than 5 feet on open shelves
- Do not store chemicals within 18 inches of sprinkler heads
- Do not store chemicals in the laboratory chemical fume hood, on the floor, in the aisles, in hallways, in areas of egress, or on the benchtop
- Store chemicals away from heat and direct sunlight

Secondary containment devices may be used where appropriate (example: chemical resistant trays)

Only laboratory-grade, explosion-proof refrigerators and freezers should be used to store properly sealed and labeled chemicals that require cool storage in the laboratory. Laboratory personnel should periodically clean and defrost refrigerators and freezers to ensure maximum efficiency. Domestic refrigerators and freezers should not be used to store chemicals; they possess ignition sources and can cause dangerous and costly laboratory fires and explosions. Do not store food or beverages in the laboratory refrigerator.

### Azos, Peroxides, and Peroxidizables

Organic azo compounds and peroxides are common reagents that often are used as free radical sources and oxidants. They are generally low-power explosives that are sensitive to shock, sparks, or other accidental ignition. They are far more shock sensitive than most primary explosives such as TNT. Inventories of these chemicals should be limited and subject to routine inspection. Many require refrigerated storage. Liquids or solutions of these compounds should not be cooled to the point at which the material freezes or crystallizes from solution, however, because this significantly increases the risk of explosion. Refrigerators and freezers storing such compounds should have a backup power supply in the event of electricity loss. Users should be familiar with the hazards of these materials and trained in their proper handling.

Certain common laboratory chemicals form peroxides on exposure to oxygen in air (see Tables below: Classes of Chemicals). Over time, some chemicals continue to build peroxides to potentially dangerous levels, whereas others accumulate a relatively low equilibrium concentration of peroxide, which becomes dangerous only after being concentrated by evaporation or distillation. (See SOP section below: Organic Peroxides.)

The peroxide becomes concentrated because it is less volatile than the parent chemical. A related class of compounds includes inhibitor-free monomers prone to free radical polymerization that on exposure to air can form peroxides or other free radical sources capable of initiating violent polymerization. Note that care must be taken when storing and using these monomers most of the inhibitors used to stabilize these compounds require the presence of oxygen to function properly, as described below. Always refer to the SDS and supplier instructions for proper use and storage of polymerizable monomers.

Essentially all compounds containing C—H bonds pose the risk of peroxide formation if contaminated with various radical initiators, photosensitizers, or catalysts. For instance, secondary alcohols such as isopropanol form peroxides when exposed to normal fluorescent lighting and contaminated with photosensitizers, such as benzophenone. Acetaldehyde, under normal conditions, autoxidizes to form acetic acid. Although this autoxidation proceeds through a peroxy acid intermediate, the steady-state concentrations of that intermediate are extremely low and pose no hazard. However, in the presence of catalysts (Co2+) and under the proper conditions of ultraviolet light, temperature, and oxygen concentration, high concentrations of an explosive peroxide can be formed. The chemicals described in the tables below represent only those materials that form peroxides in the absence of such contaminants or otherwise atypical circumstances.

Although not a requirement, it is prudent to discard old samples of organic compounds of unknown origin or history, or those prone to peroxidation if contaminated; secondary alcohols are a specific example.

*Table 1: Classes of Chemicals that can Form Peroxides*

Class A: Chemicals that form explosive levels of peroxides without concentration

| | |
|---|---|
| Isopropyl ether butadiene | Tetrafluoroethylene divinyl acetate |
| Chlorobutadiene (chloroprene) potassium amide | Vinylidene chloride |
| Potassium metal | Sodium amide (sodamide) |

Class B: Chemicals that are a peroxide hazard on concentration (distillation/evaporation). A test for peroxides should be performed if concentration is intended or suspected.

| | |
|---|---|
| Acetal | Dioxane (p-dioxane) |
| Cumene | Ethylene glycol dimethyl ether (glyme) |
| Cyclohexene | Furan |
| Cyclooctene | Methyl acetylene |
| Cyclopentene | Methyl cyclopentane |
| Diaacetylene | Methyl-isobutyl ketone |
| Dicyclopentadiene | Tetrahydrofuran |
| Diethylene glycol dimethyl ether (diglyme) | Tetrahydronaphthalene |
| Diethyl ether | Vinyl ethers |

Class C: Unsaturated monomers that may autopolymerize as a result of peroxide accumulation if inhibitors have been removed or depleted

| | |
|---|---|
| Acrylic acid | Styrene |
| Butadiene | Vinyl acetate |
| Chlorotrifluoroethylene | Vinyl Chloride |
| Ethyl acrylate | Vinyl pyridine |
| Methyl methacrylate | |

*These lists are illustrative, not comprehensive. SOURCES: Jackson et al. (1970) and Kelly (1996).

*Table 2: Types of Compounds Known to Autoxidize to Form Peroxides*

| |
|---|
| Ethers containing primary and secondary alkyl groups (never distill an ether before it has been shown to be free of peroxides) |
| Compounds containing benzylic hydrogens |
| Compounds containing allylic hydrogens (c=C-CH) containing a tertiary C-H group (decalin and 2,5-dimethylhexane |
| Compounds containing conjugated, polyunsaturated alkenes and alkynes (1,3-butadiene, vinyl acetylene) |
| Compounds containing secondary or tertiary C-H groups adjacent to an amide (1-methyl-2-pyrrolidinone) |

Class A compounds are especially dangerous when and present difficulties for disposal. Their use should be avoided if at all possible. A common substitute is a sulfuric acid–peroxydisulfate solution, and commercial cleaning solutions that contain no chromium are readily available. Confusion about appropriate cleaning bath solutions has led to explosions due to mixing of incompatible chemicals such as potassium permanganate with sulfuric acid or nitric acid with alcohols. For information about how to clean glassware appropriately, consider contacting the manufacturer of the equipment.

## Organic Peroxides

Organic peroxides are a special class of compounds with unusually low stability that makes them among the most hazardous substances commonly handled in laboratories, especially as initiators for free-radical reactions. Although they are low-power explosives, they are hazardous because of their extreme sensitivity to shock, sparks, and other forms of accidental detonation.

Many peroxides routinely used in laboratories are far more sensitive to shock than most primary explosives (e.g., TNT), although many have been stabilized by the addition of compounds that

inhibit reaction. Nevertheless, even low rates of decomposition may automatically accelerate and cause a violent explosion, especially in bulk quantities of peroxides (e.g., benzoyl peroxide). These compounds are sensitive to heat, friction, impact, and light, as well as to strong oxidizing and reducing agents. All organic peroxides are highly flammable, and fires involving bulk quantities of peroxides should be approached with extreme caution. Precautions for handling peroxides include the following:

- Limit the quantity of peroxide to the minimum amount required
- Do not return unused peroxide to the container
- Clean spills immediately. Solutions of peroxides can be absorbed on vermiculite or other absorbing material and disposed of harmlessly according to institutional procedures
- Reduce the sensitivity of most peroxides to shock and heat by dilution with inert solvents, such as aliphatic hydrocarbons. However, do not use aromatics (such as toluene) which are known to induce the decomposition of diacyl peroxides
- Do not use solutions of peroxides in volatile solvents under conditions in which the solvent might vaporize because this will increase the peroxide concentration in the solution
- Do not use metal spatulas to handle peroxides because contamination by metals can lead to explosive decomposition. Magnetic stirring bars can introduce iron which can initiate an explosive reaction of peroxides. Ceramic, Teflon, or wooden spatulas and stirring blades may be used if it is known that the material is not shock sensitive
- Do not permit open flames and other sources of heat near peroxides. It is important to label areas that contain peroxides so the hazard is evident
- Avoid friction, grinding, and all forms of impact near peroxides, especially solid peroxides. Glass containers with screw-cap lids or glass stoppers should not be used. Polyethylene bottles with screw-cap lids may be used
- To minimize the rate of decomposition, store peroxides at the lowest possible temperature consistent with their solubility or freezing point. Do not store liquid peroxides or solutions at or lower than the temperature at which the peroxide freezes or precipitates because peroxides in these forms are extremely sensitive to shock and heat

### Peroxidizable Compounds

Certain common laboratory chemicals form peroxides on exposure to oxygen in air. Over time, some chemicals continue to build peroxides to potentially dangerous levels, whereas others accumulate a relatively low equilibrium concentration of peroxide, which becomes dangerous only after being concentrated by evaporation or distillation. The peroxide becomes concentrated because it is less volatile than the parent chemical.

Excluding oxygen by storing potential peroxide formers under an inert atmosphere (N2 or argon) greatly increases their safe storage lifetime. Purchasing the chemical stored under nitrogen in septum-capped bottles is also possible. In some cases, stabilizers or inhibitors (free-radical scavengers that terminate the chain reaction) are added to the liquid to extend its storage lifetime. Because distillation of the stabilized liquid removes the stabilizer, the distillate must be stored with care and monitored for peroxide formation. Furthermore, high-performance liquid chromatography–grade solvents generally contain no stabilizer, and the same considerations apply to their handling.

- If a container of Class B and C peroxidizables is past its expiration date, and there is a risk that peroxides may be present, open it with caution and dispose of it according to institutional procedures. **If a container of a Class A peroxidizable is past its expiration date, or if the presence of peroxides is suspected or proven, do not attempt to open the container.** Because of their explosivity, these compounds can be deadly when peroxidized, and the act of unscrewing a cap or dropping a bottle can be enough to trigger an

explosion. Such containers should only be handled by experts. Contact your organization's safety personnel for assistance.
- Test for the presence of peroxides if there is a reasonable likelihood of their presence and the expiration date has not passed

## Peroxide Detection Test

WARNING: Do not test Class A peroxidizables suspected of or known to contain peroxides. Contact AR-EHS for further instruction.

The following tests detect most (not all) peroxy compounds, including all hydroperoxides:

- Peroxide test strips, which turn to an indicative color in the presence of peroxides, are available commercially. Note that these strips must be air dried until the solvent evaporates and exposed to moisture for proper indication and quantification
- Add 1 to 3 mL of the liquid to be tested to an equal volume of acetic acid, add a few drops of 5% aqueous potassium iodide solution, and shake. The appearance of a yellow to brown color indicates the presence of peroxides. Alternatively, addition of 1 mL of a freshly prepared 10% solution of potassium iodide to 10 mL of an organic liquid in a 25-mL glass cylinder produces a yellow color if peroxides are present
- Add 0.5 mL of the liquid to be tested to a mixture of 1 mL of 10% aqueous potassium iodide solution and 0.5 mL of dilute hydrochloric acid to which has been added a few drops of starch solution just prior to the test. The appearance of a blue or blue-black color within 1 minute indicates the presence of peroxides

None of the above tests should be applied to materials (such as metallic potassium) which may be contaminated with inorganic peroxides.

## Disposal of Peroxides

Check with state and federal environmental agencies before attempting to treat any chemical for the purpose of disposal without a permit. Pure peroxides should never be disposed of directly, but must be diluted before disposal. Small quantities (less than 25 grams) of peroxides are generally disposed by dilution with water to a concentration of 2% or less, after which the solution is transferred to a polyethylene bottle containing an aqueous solution of a reducing agent, such as ferrous sulfate or sodium bisulfite. The material can then be handled as a waste chemical; however, it must not be mixed with other chemicals for disposal. Spilled peroxides should be absorbed on vermiculite or other absorbent as quickly as possible. The vermiculite–peroxide mixture can be burned directly or may be stirred with a suitable solvent to form a slurry that can be handled according to institutional procedures. Organic peroxides should never be flushed down the drain.

Large quantities (>25 g) of peroxides require special handling and should only be disposed of by an expert or a bomb squad. Each case should be considered separately, and handling, storage, and disposal procedures should be determined by the physical and chemical properties of the particular peroxide [see also Hamstead (1964)].

Peroxidized solvents such as tetrahydrofuran (THF), diethyl ether, and 1,4-dioxane may be disposed of in the same manner as the nonautoxidized solvent. Care should be taken to ensure that the peroxidized solvent is not allowed to evaporate and thus concentrate the peroxide during handling and transport.

## Non-Research Chemical Inventory

The SSC Service Solutions is contracted by WTAMU and the Texas A&M University System to operate operations of the grounds, custodial services, and building maintenance at WTAMU. SSC is responsible for maintaining their own environmental health and safety programs and standard

operating procedures. As such, SSC is not included in any of the compliance standard operating procedures at WTAMU. Chemicals that may be in usage in other WTAMU areas, outside the SSC, will maintain a chemical inventory through MSDSOnline – and will be facilitated by AR-EHS. These areas include AR-EHS, Fire and Life Safety, the lock shop, and the University Police Department.

**TRAINING**

West Texas A&M University Environmental Health and Safety will follow the Texas A & M University System Policy 33.05.02 Required Employee Training. Staff and faculty whose required training is delinquent more than 90 days will have their access to the Internet terminated until all trainings are completed. Only Blackboard and Single Sign-on will be accessible. Internet access will be restored once training has been completed. Student workers whose required training is delinquent more than 90 days will need to be terminated by their manager through Student Employment.

**RECORD RETENTION**

No official state records may be destroyed without permission from the Texas State Library as outlined in Texas Government Code, Section 441.187 and 13 Texas Administrative Code, Title 13, Part 1, Chapter 6, Subchapter A, Rule 6.7. The Texas State Library certifies Agency retention schedules as a means of granting permission to destroy official state records.
West Texas A & M University Records Retention Schedule is certified by the Texas State Library and Archives Commission. West Texas A & M University Environmental Health and Safety will follow Texas A & M University Records Retention Schedule as stated in the Standard Operating Procedure 61.99.01.W0.01 Records Management. All official state records (paper, microform, electronic, or any other media) must be retained for the minimum period designated.

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## Related Statutes, Policies, or Requirements

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24.01 Risk Management
Environmental Protection Agency (EPA) – Emergency Planning and Community Right-to-Know Act (EPCRA) hazardous chemical storage reporting
Department of Homeland Security (DHS) – Chemicals of Interest (COI) Centers for Disease Control and Prevention (CDC) – Select agents and toxins
Drug Enforcement Agency (DEA) – Controlled Substances and List I & II regulated chemicals
International Building Code - Flammable material and other storage limits Local Fire Department Requirements – Flammable material storage limits

Veterans Administration (VA) – mandated inventory reconciliation every 6 months for VA funded researchers
Prudent Practices in a Laboratory, 11th edition

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## Contact Office

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WTAMU Academic and Research Environmental Health and Safety
(806) 651-2270