
**THE UNIVERSITY OF TENNESSEE
SPACE INSTITUTE**



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SUBJECT: THE UNIVERSITY OF TENNESSEE SPACE INSTITUTE PROCEDURE FOR CHEMICAL HYGIENE PLAN

1. Purpose. To establish procedures for the development and implementation of a Chemical Hygiene plan.

TABLE OF CONTENTS

Section 1. Introduction

- 1.1 Commitment
- 1.2 Policy

Section 2. Authority and Responsibilities

- 2.1 Safety Officer
- 2.2 Chemical Hygiene Officer
- 2.3 Laboratory Staff Supervisor and/or Principle Projects Investigator
- 2.4 Laboratory Staff

Section 3. Laboratory Safety Procedures and Practices

- 3.1 General Safety Guidelines
- 3.2 Procedures
 - 3.2.1 Highly Toxic or Hazardous Chemicals
 - 3.2.2 Chemical Spill Procedure

Section 4. Chemical Orders Procedure

Section 5. Chemical Wastes Disposal

Section 6. Training

Section 7. Monitoring Exposure (Pending)

Section 8. Medical Consultation (Pending)

Section 9. Respiratory Protection (Pending)

Appendix A. Material Safety Data Sheet Explanation Appendix

B. EPA Chemical Compatibility Chart

1

SUBJECT: THE UNIVERSITY OF TENNESSEE SPACE INSTITUTE PROCEDURE FOR CHEMICAL HYGIENE PLAN

Section 1. Introduction.

1.1 Commitment. The University of Tennessee Space Institute (UTSI) is fully committed to providing a safe and healthful work environment for every employee. Sometimes it is necessary for employees to work with or around potentially hazardous substances. In these instances, it is important that employees are aware of the substance's identity, health-related and physical properties and the work practices required to minimize potential hazards.

1.2 Policy. It is the policy of UTSI to develop and implement a Chemical Hygiene Plan. The Safety Officer (SO) will work with the Chemical Hygiene Officer to establish plans and procedures to assure the safe handling and disposal of chemicals.

References:

- 1) 29 CFR 1910.1450 "Occupational Exposure to Hazardous Chemicals in Laboratories".
- 2) UTSI Safety Manual, "UTSI-0400 Hazardous Material Safety".
- 3) UTSI Safety Manual, "UTSI-0700 Safety and Environmental Health Responsibilities".

Section 2. Authority and Responsibilities

2.1 Safety Officer

- a. Development of a procedure for the ranking hazards associated with specific procedures.
- b. Develop personal protective equipment guidelines based upon the hazards associated with specific procedures.
- c. Advise staff on personal protective equipment.

2.2 Chemical Hygiene Officer

- a. Staff training to supplement laboratory supervisors training.
- b. Laboratory inspections.
- c. Monitoring hoods and other protective devices.
- d. Approve use of toxic and highly hazardous chemicals.
- e. Monitoring employee exposure to chemicals as needed.
- f. Review of designs for new construction.
- g. Emergency response to hazardous material spills.
- h. Oversee the handling of hazardous materials.
- i. Oversee the disposal of excess hazardous materials.

2

SUBJECT: THE UNIVERSITY OF TENNESSEE SPACE INSTITUTE PROCEDURE FOR CHEMICAL HYGIENE PLAN

2.3 Faculty/Principle Investigator/Supervisor Provide a Safe Environment Within the Laboratories Under their Control

- a. Assemble an inventory list of all chemicals.
- b. Ensure written procedures and chemical hazard information is accessible to laboratory personnel.
- c. Request assistance from the SO as needed regarding hazard information and training.
- d. Provide specific training on the hazards of the chemicals used and proper chemical handling techniques.
- e. Ensure that laboratory employees follow proper procedures in the handling and disposal of chemicals.
- f. Ensure that staff complies with the Hazard Communication Program.
- g. Maintain a list of all chemicals under their control.
- h. Identify and label each procedure to be utilized according to the Hazard Ranking developed by the SO.
- i. Train all students on proper safety procedures and the procedures for emergencies.
- j. Ensure that all containers are properly labeled and appropriate warning signage is displayed.
- k. Ensure that all students have and use appropriate protective equipment.
- l. Ensure that all hazardous material is disposed in accordance with approved procedures.

2.4 Laboratory Staff and Student

- a. Handle all chemicals safely.
- b. Adhere to established policies and procedures.
- c. Follow safe work practices.
- d. Wear appropriate personal protective equipment.
- e. Staff and students with preexisting medical conditions that may place them at an increased risk of adverse effects must contact Occupational Health Services.

Section 3. Laboratory Safety Procedures and Practices

3.1 General Safety Guidelines. The following practices are to be followed by all employees, faculty and students in the laboratory.

- a. Lab coats are recommended for chemical operations in the laboratory. Lab coats should not be worn outside the laboratory.
- b. Hands should be washed after removing protective gloves and prior to leaving the laboratory.
- c. There is to be no eating or drinking in the laboratory.
- d. Mouth pipetting is forbidden.
- e. Splash goggles should be worn when handling hazardous liquids.
- f. Face shields that effectively block UV light should be worn when visualizing or photographing with UV light.
- g. Protective gloves should be worn to prevent skin contact with any potentially hazardous substance.

- h. Chemicals with harmful vapors should be handled within the fume hoods whenever possible. (A volatile compound with a TLV of less than 50 ppm should be handled only in a fume hood).
- i. Adhere to the following procedures when utilizing the fume hood:
 - 1) Check to see that the hood is operating.
 - 2) Keep all operations six (6) inches back from the hood face.

- 3) Keep baffle slots and airfoil free of obstructions. 4) Keep sash height to a minimum.
- 5) Do not put head into the hood.
- 6) Do not store chemicals or apparatus in hood.
- 7) Do not dispose of chemicals in the fume hood.

3.2 Procedures

3.2.1 Highly Toxic or Hazardous Chemicals. Procedures that require the use of a highly toxic or hazardous chemical should be approved by Safety Office. A chemical is considered highly toxic and/or hazardous if it meets one of the following criteria:

1. A listed human or suspected human carcinogen as listed in the ACGIH TLV Booklet.
2. A chemical that has a level that is immediately dangerous to life and health (IDLH) of five (5) parts per million (ppm) or less as published by the National Institute of Occupational Safety and Health (NIOSH). See list of extremely toxic chemical substances.
3. A known human mutagen or teratogen.
4. A chemical which has a:
 - a) LD50 of 50 mg/kg or less when administered orally to albino rats.
 - b) LD50 of 200 mg/kg or less when administered by continuous contact for 24 hours to the bare skin or albino rabbits.
 - c) LC50 in air of 200 ppm or less of gas or vapor or 2 mg/liter or less of dust mist or fume when administered by continuous inhalation to albino rats.

3.2.2 Chemical Spill Procedure

1. Evaluate the Spill
 - a) Are the materials Innocuous, Corrosive, Flammable, Toxic or Explosive?
 - b) Identify all materials by common or chemical name.
 - c) Estimate how much is spilled.
 - d) Evaluate the degree of danger to patients, staff or visitors.
 - e) Evaluate the degree of danger to equipment or property.
2. Contain the Spill. Utilize any action designed to prevent the spilled material from spreading and causing increased damage.
3. EVACUATE the area if the spill cannot be contained, OR if the spilled material produces irritating odors, flammable vapors or explosive vapors. (Extinguish all spark or ignition sources).
4. CLEAN up the spilled material.
 - a) Spills of innocuous material can be cleaned up by laboratory personnel or equipped staff.

SUBJECT: THE UNIVERSITY OF TENNESSEE SPACE INSTITUTE PROCEDURE FOR CHEMICAL HYGIENE PLAN

- b) Spills of acids, bases and flammables can be cleaned up by laboratory personnel using appropriate neutralizers/absorbents and proper personal protective equipment.

 - c) Spills of toxic or explosive material, and large spills of corrosive or flammable materials shall be handled by HSE. Immediately call the Emergency Telephone Number and have the following information available:
 - Your name and phone number
 - Precise location of spill
 - Exact description of what was spilled (make sure you state any compounds which may form toxic compounds)
 - Any steps you have taken to control the spill
 - Any injuries that have occurred
5. DISPOSE of all contaminated materials in accordance with this Policy.

 6. Employees who have been exposed to hazardous chemicals due to a spill or other uncontrolled situation shall promptly report to the SO in accordance with the instructions in the safety manual (Notify Safety Officer at Extension 37208 or at 931-808-5955 during off-hours and weekends.). The individual's supervisor shall complete a report of the Incident (UTSI Safety Manual, Appendix A).

 7. Consult the CHO at 37208 with any question regarding chemical spills and spill cleanup.

Section 4. Chemical Order Procedure. All requests for the purchase of chemicals must be reviewed by the CHO.

Section 5. Chemical Waste Disposal. Unwanted chemicals must be disposed of through the SO according to the following guidelines:

- a. All chemicals must be identified by its specific name, the laboratory disposing of it, the principal investigator and a contact person's name and phone number. Label all bags, boxes or bottles with an indelible ink marker or with labels that adhere tightly.
- b. Mixtures should be identified as to its chemical composition and concentration. Nonspecific designations such as "waste solvent" or "waste acids" are not acceptable.
- c. All waste chemicals are to be sorted in containers of similar construction to the container in which the manufacturer shipped the original material.
- d. All chemicals should be transported on carts using a route that will minimize the exposure to the general public in case of an accident. The chemicals should be transported using secondary containment designed to hold the entire contents of the waste container in the event of breakage.
- e. No infectious, red bag, or radioactive material will be accepted.

SUBJECT: THE UNIVERSITY OF TENNESSEE SPACE INSTITUTE PROCEDURE FOR CHEMICAL HYGIENE PLAN

- f. Chemicals are not to be left at any of the chemical collection sites unless someone is there to receive it.
- g. Separate bottles or glassware from contaminated lab waste or spill cleanup material.
- h. Chlorinated and non-chlorinated solvents should not be mixed for disposal.
- i. Polychlorinated biphenyls (PCBs), Polychlorodibenzofurans (PCDFs), pyridine and mercaptan compounds must be segregated from other chlorinated and non-chlorinated chemicals and appropriately labeled.

- j. Arrangements for the pick-up of large quantities of chemicals and questions about specific waste chemical handling should be directed to SO.

Section 6. Training. Every employee that is involved with the use of chemicals is required to obtain training in the safe handling of chemicals and to read and understand the Chemical Hygiene Plan. The supervisor or principal investigator will provide information on laboratory-specific procedures and the hazards associated with these laboratory procedures. The Safety Officer and the Chemical Hygiene Officer are available to assist in the development or presentation of appropriate training.

Section 7. Monitoring Exposure. Employees who may be exposed to a chemical above the OSHA Action Level (AL) or Permissible Exposure Level (PEL) will have their breathing zone monitored by Safety Office to determine exposure level. This may require use of specialized equipment or contractors.

Section 8. Medical Consultation. Employees exposed to a hazardous material above the Action Level or Permissible Exposure Level, as a result of a spill, leak or explosion or exhibiting signs of overexposure, are to be evaluated under procedures established by the UTSI Safety Manual. Employees who exceed the OSHA Action limit for substance with which they work will be placed in the appropriate medical monitoring program.

Section 9. Respiratory Protection. Those individuals who require respiratory protection will be placed in a respiratory protection program developed and implemented by the individual's department in accordance with UT Policy Respiratory Protection GS15 and will be provided appropriate respiratory protection.

Appendix A. Safety Data Sheet Explanation

Section 1: Identification

This section identifies the chemical on the SDS as well as the recommended uses. It also provides the essential contact information of the supplier. The required information consists of:

- Product identifier used on the label and any other common names or synonyms by which the substance is known.
- Name, address, phone number of the manufacturer, importer, or other responsible party, and emergency phone number.
- Recommended use of the chemical (e.g., a brief description of what it actually does, such as flame retardant) and any restrictions on use (including recommendations given by the supplier).

Section 2: Hazard(s) Identification

This section identifies the hazards of the chemical presented on the SDS and the appropriate warning information associated with those hazards. The required information consists of:

- The hazard classification of the chemical (e.g., flammable liquid, category).
- Signal word.
- Hazard statement(s).
- Pictograms (the pictograms or hazard symbols may be presented as graphical reproductions of the symbols in black and white or be a description of the name of the symbol (e.g., skull and crossbones, flame).
- Precautionary statement(s).
- Description of any hazards not otherwise classified.
- For a mixture that contains an ingredient(s) with unknown toxicity, a statement describing how much (percentage) of the mixture consists of ingredient(s) with unknown acute toxicity. Please note that this is a total percentage of the mixture and not tied to the individual ingredient(s).

Section 3: Composition/Information on Ingredients

This section identifies the ingredient(s) contained in the product indicated on the SDS, including impurities and stabilizing additives. This section includes information on substances, mixtures, and all chemicals where a trade secret is claimed. The required information consists of: **Substances**

- Chemical name.
- Common name and synonyms.
- Chemical Abstracts Service (CAS) number and other unique identifiers.
- Impurities and stabilizing additives, which are themselves classified and which contribute to the classification of the chemical.

Mixtures

- Same information required for substances.
- The chemical name and concentration (i.e., exact percentage) of all ingredients which are classified as health hazards and are:
 - Present above their cut-off/concentration limits or
 - Present a health risk below the cut-off/concentration limits.
- The concentration (exact percentages) of each ingredient must be specified except concentration ranges may be used in the following situations:
 - A trade secret claim is made,
 - There is batch-to-batch variation, or
 - The SDS is used for a group of substantially similar mixtures.

Chemicals where a trade secret is claimed

- A statement that the specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret is required.

Section 4: First-Aid Measures

This section describes the initial care that should be given by untrained responders to an individual who has been exposed to the chemical. The required information consists of:

- Necessary first-aid instructions by relevant routes of exposure (inhalation, skin and eye contact, and ingestion).
- Description of the most important symptoms or effects, and any symptoms that are acute or delayed.
- Recommendations for immediate medical care and special treatment needed, when necessary.

Section 5: Fire-Fighting Measures

This section provides recommendations for fighting a fire caused by the chemical. The required information consists of:

- Recommendations of suitable extinguishing equipment, and information about extinguishing equipment that is not appropriate for a particular situation.
- Advice on specific hazards that develop from the chemical during the fire, such as any hazardous combustion products created when the chemical burns.
- Recommendations on special protective equipment or precautions for firefighters.

Section 6: Accidental Release Measures

This section provides recommendations on the appropriate response to spills, leaks, or releases, including containment and cleanup practices to prevent or minimize exposure to people, properties, or the environment. It may also include recommendations distinguishing between responses for large and small spills where the spill volume has a significant impact on the hazard. The required information may consist of recommendations for:

- Use of personal precautions (such as removal of ignition sources or providing sufficient ventilation) and protective equipment to prevent the contamination of skin, eyes, and clothing.
- Emergency procedures, including instructions for evacuations, consulting experts when needed, and appropriate protective clothing.
- Methods and materials used for containment (e.g., covering the drains and capping procedures).
- Cleanup procedures (e.g., appropriate techniques for neutralization, decontamination, cleaning or vacuuming; adsorbent materials; and/or equipment required for containment/clean up)

Section 7: Handling and Storage

This section provides guidance on the safe handling practices and conditions for safe storage of chemicals. The required information consists of:

- Precautions for safe handling, including recommendations for handling incompatible chemicals, minimizing the release of the chemical into the environment, and providing advice on general hygiene practices (e.g., eating, drinking, and smoking in work areas is prohibited).
- Recommendations on the conditions for safe storage, including any incompatibilities. Provide advice on specific storage requirements (e.g., ventilation requirements)

Section 8: Exposure Controls/Personal Protection

This section indicates the exposure limits, engineering controls, and personal protective measures that can be used to minimize worker exposure. The required information consists of:

- OSHA Permissible Exposure Limits (PELs), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs), and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the safety data sheet, where available.
- Appropriate engineering controls (e.g., use local exhaust ventilation, or use only in an enclosed system).
- Recommendations for personal protective measures to prevent illness or injury from exposure to chemicals, such as personal protective equipment (PPE) (e.g., appropriate types of eye, face, skin or respiratory protection needed based on hazards and potential exposure).
- Any special requirements for PPE, protective clothing or respirators (e.g., type of glove material, such as PVC or nitrile rubber gloves; and breakthrough time of the glove material).

Section 9: Physical and Chemical Properties

This section identifies physical and chemical properties associated with the substance or mixture. The minimum required information consists of:

- Appearance (physical state, color, etc.);
- Upper/lower flammability or explosive limits;

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- Odor;
- Vapor pressure;
- Odor threshold;
- Vapor density;
- pH;
- Relative density;
- Melting point/freezing point;
- Solubility(ies);
- Initial boiling point and boiling range;
- Flash point;
- Evaporation rate;
- Flammability (solid, gas);
- Partition coefficient: n-octanol/water;
- Auto-ignition temperature; ▪ Decomposition temperature; and ▪ Viscosity.

The SDS may not contain every item on the above list because information may not be relevant or is not available. When this occurs, a notation to that effect must be made for that chemical property. Manufacturers may also add other relevant properties, such as the dust deflagration index (Kst) for combustible dust, used to evaluate a dust's explosive potential

Section 10: Stability and Reactivity

This section describes the reactivity hazards of the chemical and the chemical stability information. This section is broken into three parts: reactivity, chemical stability, and other. The required information consists of:

Reactivity

- Description of the specific test data for the chemical(s). This data can be for a class or family of the chemical if such data adequately represent the anticipated hazard of the chemical(s), where available.

Chemical stability

- Indication of whether the chemical is stable or unstable under normal ambient temperature and conditions while in storage and being handled.
- Description of any stabilizers that may be needed to maintain chemical stability.
- Indication of any safety issues that may arise should the product change in physical appearance.

Other

- Indication of the possibility of hazardous reactions, including a statement whether the chemical will react or polymerize, which could release excess pressure or heat, or create other hazardous conditions. Also, a description of the conditions under which hazardous reactions may occur.

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- List of all conditions that should be avoided (e.g., static discharge, shock, vibrations, or environmental conditions that may lead to hazardous conditions).
- List of all classes of incompatible materials (e.g., classes of chemicals or specific substances) with which the chemical could react to produce a hazardous situation.

List of any known or anticipated hazardous decomposition products that could be produced because of use, storage, or heating. (Hazardous combustion products should also be included in Section 5 (Fire-Fighting Measures) of the SDS.)

Section 11: Toxicological Information

This section identifies toxicological and health effects information or indicates that such data are not available. The required information consists of:

- Information on the likely routes of exposure (inhalation, ingestion, skin and eye contact). The SDS should indicate if the information is unknown.
- Description of the delayed, immediate, or chronic effects from short- and long-term exposure.
- The numerical measures of toxicity (e.g., acute toxicity estimates such as the LD50 (median lethal dose)) - the estimated amount [of a substance] expected to kill 50% of test animals in a single dose.
- Description of the symptoms. This description includes the symptoms associated with exposure to the chemical including symptoms from the lowest to the most severe exposure.
- Indication of whether the chemical is listed in the National Toxicology Program (NTP) Report on Carcinogens (latest edition) or has been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest editions) or found to be a potential carcinogen by OSHA

Section 12: Ecological Information (non-mandatory)

This section provides information to evaluate the environmental impact of the chemical(s) if it were released to the environment. The information may include:

- Data from toxicity tests performed on aquatic and/or terrestrial organisms, where available (e.g., acute or chronic aquatic toxicity data for fish, algae, crustaceans, and other plants; toxicity data on birds, bees, plants).
- Whether there is a potential for the chemical to persist and degrade in the environment either through biodegradation or other processes, such as oxidation or hydrolysis.
- Results of tests of bioaccumulation potential, making reference to the octanol-water partition coefficient (K_{ow}) and the bioconcentration factor (BCF), where available.
- The potential for a substance to move from the soil to the groundwater (indicate results from adsorption studies or leaching studies).
- Other adverse effects (e.g., environmental fate, ozone layer depletion potential, photochemical ozone creation potential, endocrine disrupting potential, and/or global warming potential).

Section 13: Disposal Considerations (non-mandatory)

This section provides guidance on proper disposal practices, recycling or reclamation of the chemical(s) or its container, and safe handling practices. To minimize exposure, this section should also refer the reader to Section 8 (Exposure Controls/Personal Protection) of the SDS. The information may include:

- Description of appropriate disposal containers to use.
- Recommendations of appropriate disposal methods to employ.
- Description of the physical and chemical properties that may affect disposal activities.
Language discouraging sewage disposal.
- Any special precautions for landfills or incineration activities

Section 14: Transport Information (non-mandatory)

This section provides guidance on classification information for shipping and transporting of hazardous chemical(s) by road, air, rail, or sea. The information may include:

- UN number (i.e., four-figure identification number of the substance).
- UN proper shipping name¹.
- Transport hazard class(es).
- Packing group number, if applicable, based on the degree of hazard.
- Environmental hazards (e.g., identify if it is a marine pollutant according to the International Maritime Dangerous Goods Code (IMDG Code)).
- Guidance on transport in bulk (according to Annex II of MARPOL 73/78 and the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (International Bulk Chemical Code (IBC Code))).
- Any special precautions which an employee should be aware of or needs to comply with, in connection with transport or conveyance either within or outside their premises (indicate when information is not available).

Section 15: Regulatory Information (non-mandatory)

This section identifies the safety, health, and environmental regulations specific for the product that is not indicated anywhere else on the SDS. The information may include:

- Any national and/or regional regulatory information of the chemical or mixtures (including any OSHA, Department of Transportation, Environmental Protection Agency, or Consumer Product Safety Commission regulations)

Section 16: Other Information

This section indicates when the SDS was prepared or when the last known revision was made. The SDS may also state where the changes have been made to the previous version. You may wish to contact the supplier for an explanation of the changes. Other useful information also may be included here.

SUBJECT: THE UNIVERSITY OF TENNESSEE SPACE INSTITUTE PROCEDURE FOR CHEMICAL HYGIENE PLAN

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[The EPA Chemical Compatibility Guide may be found here.](#)

