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APPROVED: DR. BUKLEY, Interim Associate Vice President _____

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.

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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 substances 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. Approval of procedures involving 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.

2.3 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.

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- 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 affects 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 must be registered with and approved by Health, Safety and Environment. 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.
 - b) Spills of acids, bases and flammables can be cleaned up by laboratory personnel using appropriate neutralizers/absorbents and proper personal protective equipment.

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- 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 313 or at 931-455-1734 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 487 with any question regarding chemical spills and spill clean up.

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.
- 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 (Pending). 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 Health, Safety and Environment to determine exposure level.

Section 8. Medical Consultation (Pending). 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. See HSE Policy on Incident and Injury Reporting. 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 (Pending). Those individuals who are determined by the SO or designee to require respiratory protection will be placed in the respiratory protection program and will be provided appropriate respiratory protection as defined in the UTSI Safety Manual UTSI-0700-8.

Appendix A. Material Safety Data Sheet Explanation

Section 1 - Manufacturer. The first section of the MSDS identifies the product. It lists the name of the product, any trade names, the product manufacturer's name and address. This section will also list any emergency telephone number(s).

Section 2 - Hazardous Ingredients Identity. This section lists the chemical ingredients that make up the product and that may harm you. It also lists the concentration of the chemical to which you can safely be exposed, often listed as the "permissible exposure limit" (PEL) or the "threshold limit value" (TLV). These exposure limits are usually figured for average exposure over a typical work shift.

Section 3 - Physical and Chemical Characteristics. This section describes the chemical's appearance, odor and other characteristics. It also describes the "percent volatile" (for example, how much of a chemical evaporates at room temperature). You should note that some chemicals such as sulfuric acid have a low percent volatile, but can be harmful if inhaled.

Section 4 - Fire and Explosion Data. In this section you can find the temperature at which the chemical ignites (flash point). If a chemical is flammable, it ignites below 100 degrees F. If it is combustible, it ignites at 100 degrees F or above. This section also lists the extinguishing media (what will put out the fire safely).

Section 5 - Physical Hazards (Reactivity Data). Here you will find whether the chemical "reacts" with materials or conditions. "Incompatibility" lists the materials, such as water or other chemicals that cause the chemical to burn, explode, or release dangerous gases. "Instability" lists the environmental conditions such as heat or direct sunlight that can cause a dangerous reaction.

Section 6 - Health Hazards. This very important section lists symptoms of overexposure, aggravated by exposure such as a skin rash, burn, headache, or dizziness. It also lists the first aid and emergency procedures in case of overexposure, such as flushing your exposed skin with running water for 15 minutes. It may also list any medical conditions that can be aggravated by exposure to the chemical. If you are exposed to a chemical and require medical attention, you should bring a copy of the MSDS to the hospital or to your doctor.

Section 7 - Special Precautions and Spill/Leak Procedures. This section tells you what to use to clean up an accidental spill or leak. No matter what the chemical is, always notify your supervisor right away. Before cleaning up a chemical spill, you may need to wear respiratory protection, gloves, safety goggles, or other protective-specific items that are recommended, such as clothing. This section may also include notes on how to dispose of the chemical safely. Here you will also find a listing of any personal protective equipment (respiratory protection, gloves, eye protection) you need to work safely with the chemical. If protective equipment is needed, this section may list the specific types that are recommended such as full-face mask respirator, rubber gloves and chemical safety goggles.

Section 8 - Special Protection Information/Control Measures. This section lists any other special precautions to follow when handling the chemical. This may include what to have nearby to help clean up a spill or put out a fire, and what safety signs to post near the chemical. This section also lists any other health and safety information not covered in other parts of the MSDS.

