NMSU College of Engineering

CHEMICAL HYGIENE PLAN
Revision B – 07/16/18

Status: Released

Record of Document Revisions

Revision	Date	Description of Changes
A	12/03/15	Initial Release
B	07/16/18	Update personnel, delete WERC department, delete temporary lab locations, add restriction of minors and working alone in labs

NMSU College of Engineering
CHEMICAL HYGIENE PLAN Rev B 10/31/16

TABLE OF CONTENTS

OCCUPATIONAL EXPOSURES TO HAZARDOUS CHEMICALS IN LABORATORIES (29 CFR 1910.1450) NMSU College of Engineering CHEMICAL HYGIENE PLAN Rev A 12/03/15

1.0 INTRODUCTION

This section should be used to establish the role of the Chemical Hygiene Plan within COLLEGE OF ENGINEERING.

1.1 History of the OSHA Laboratory Standard

On November 25, 1983, the Occupational Safety and Health Administration (OSHA) published the Hazard Communication Standard which applied to certain manufacturers and in part to certain laboratories. OSHA received many comments regarding whether the procedures of the Hazard Communication Standard should apply to laboratories where the staff is usually highly educated. OSHA decided although "...31.9% of all laboratory workers have bachelors degrees, 20.6% have masters degrees, and 20.9% have doctorates...," that, "...there is some question as to whether laboratory workers actually make themselves as knowledgeable as they should be and some laboratory employees are not professionally trained." 51 FR 26664.

Other unique differences for laboratories were noted including: the small amounts of chemicals used; the vast numbers of different chemicals involved; and that nearly half of the laboratories in one survey could not accurately predict their chemical needs even one month in advance.

OSHA decided that "...Despite the existence of the unique characteristics of laboratory work places, in actual practice incidents of acute adverse health effects resulting from exposures to toxic substances in laboratories do occur. Furthermore, some studies...have shown increased risks of certain types of diseases for laboratory workers. In addition, although laboratory workers are, in general, a well educated work force, there is evidence that many laboratories do not have health and safety programs...". Therefore, OSHA proposed the Occupational Exposures to Hazardous Chemicals in Laboratories" rule from which this Chemical Hygiene Plan originates.

On January 31, 1990, The Department of Labor published in the Federal Register an amendment to 29 CFR 1910, Subpart Z, identified as Section 1910.1450. The title of that amendment is "Occupational exposure to hazardous chemicals in the laboratory", but is better known as the "Laboratory Standard" (Attachment A).

The effective date of the standard is May 1, 1990. A part of that standard is the requirement for the development of a chemical hygiene plan. That plan must be developed and implemented by January 31, 1991.

1.1.1 Summary of the Laboratory Standard

SUMMARY OF OSHA's
HEALTH AND SAFETY STANDARDS;
OCCUPATIONAL EXPOSURE TO
HAZARDOUS CHEMICALS IN LABORATORIES
(29 CFR 1910.1450 LAB STANDARD)

A. Scope and Application
1. Applies to all employers whose laboratories use hazardous chemicals.
2. This amends (for laboratories) all other provisions of 29 CFR 1910 Subpart Z except for PEL.

3. This does not apply to activities that do not fit term "laboratory use".

B. Definitions (See Appendix A)
1. Laboratory - Means any facility where the "laboratory use of hazardous chemicals" occur. It is a work place where relatively small quantities of hazardous chemicals are used on a non-production basis.
2. 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 work places whose function is to produce commercial quantities of materials.
3. Laboratory use of hazardous chemicals - Means handling or use of such chemicals in which all of the following conditions are met:
   a) Chemical manipulations are carried out on a laboratory scale,
   b) Multiple chemical procedures or chemicals are used,
   c) The procedures involved are not part of a production process, nor in any way simulate a production process, and
   d) Protective laboratory practices and equipment are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

C. Laboratory Standard Application
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;
2. Prohibition of eye and skin contact where specified by any OSHA health standard shall observed;
3. Where the action level or the PEL is routinely exceeded for an OSHA regulated substance the monitoring and medical surveillance parts of the standard will be applied.

D. Employee Exposure Determination
1. Initial monitoring - The employer shall measure an employees exposure to any substance regulated by a standard which requires monitoring if there is reason to believe that exposure levels exceed the PEL or action level.
2. Periodic monitoring - If initial monitoring indicates employee exposure above the PEL or action level the employer shall immediately comply with the monitoring provisions of the relevant standard.
3. Termination of monitoring - the employer may terminate monitoring in accordance with the relevant standard.
4. The employee must be notified of the result of the monitoring within 15 days of

the employer's receipt of the results.

E. Chemical Hygiene Plan
1. Where hazardous chemicals are used in the work place, the employer shall develop and carry out the provisions of a chemical hygiene plan which is:
   a) Capable of protecting employees from health hazards associated with hazardous chemicals in that laboratory and
   b) Capable of keeping the exposures below the action level or PEL.
2. The Chemical Hygiene Plan must be readily accessible to employees.
3. The Chemical Hygiene Plan shall include each of the following elements and shall indicate specific measures the employer will take to ensure laboratory employee protection:
   a) Standard operating procedures relevant to safety and health;
   b) Criteria employer will use to implement control measures to reduce employee exposure to hazardous chemicals;
   c) A requirement that fume hoods and other protective equipment are functioning properly and methods to be taken to ensure proper and adequate performance;
   d) Provisions for employee training and information;
   e) Circumstances requiring prior approval from the employer or his designee before implementation;
   f) Provisions for medical consultation and examination;
   g) Designation of personnel responsible for implementation of the Chemical Hygiene Plan.
   h) Provisions for additional protection for employees working with particularly hazardous substances including:
      select carcinogens
      reproductive toxins
      substances with 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.
4. The employer shall review and update the plan on a yearly basis.

F. Employee Information and Training
1. The employer shall provide employees with information and training to ensure that they are apprised of the hazards of chemicals in their work area.
2. 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.
3. Information - employees shall be informed of:
   a) The contents of this standard
   b) The location and availability of the Chemical Hygiene Plan;
   c) The PELs for OSHA regulated substances or recommended exposure limits for other hazardous chemicals where PELs do not exist.
   d) Signs and symptoms associated with exposures to the hazardous chemicals used in the laboratory; and
   e) The location and availability of known reference materials including SDSs, but not limited to them.

4. Training - Employee training shall include:
    a) Methods and observations that may be used to detect the presence or release of a hazardous chemical;
    b) The physical and health hazards of chemicals in the work area;
    c) Measures employees can use to protect themselves from these hazards, including specific procedures such as appropriate work practices, emergency procedures, and personal protective equipment to be used.

    The employee shall be trained on the applicable details of the employers written Chemical Hygiene Plan.

G. Medical Consultation and Medical Examinations.
1. The employer shall provide all employees who work with hazardous chemicals an opportunity to receive medical attention under the following circumstances.
    a) When the employee develops signs and/or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory;
    b) When routine monitoring reveals an exposure above the PEL or action level;
    c) When an event takes place in the work area such as a spill or leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure.
2. All medical examinations and consultations shall be performed by a licensed physician or under his/her direct supervision.
3. Information provided to the physician - The employer shall provide the following information to the physician:
    a) The identity of the hazardous chemicals to which the employee may have been exposed;
    b) A description of the conditions under which the exposure occurred; and
    c) A description of the signs and symptoms of exposure the employee is experiencing, if any.
4. Physicians written opinion including:
    a) Any recommendation for further medical follow-up;
    b) The results of the 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; and
    d) A statement that the employee has been informed by the physician of the results of the examination and an medical condition that may require further examination or treatment.
    e) The written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure.

H. Hazard Identification
1. With respect to labels and Material Safety Data Sheets:
    a) Employers shall ensure that labels on incoming hazardous chemicals are not removed or defaced.
    b) Employers shall maintain any MSDSs received and make them readily available to employees.
2. The following provisions shall apply to chemicals substances developed in the laboratory:
    a) If the composition of a chemical substance produced for laboratory use is known and determined to be hazardous, the employer shall supply appropriate training.
    b) If the chemical produced is a by-product whose composition is not known, the employer shall assume that it is hazardous and implement

the Chemical Hygiene Plan.

c) If the chemical substance is produced for another user outside of the laboratory, the employer shall comply with the Hazard Communication Standard (29 CFR 1910.100) including the requirements for the preparation of a Material Safety Data Sheet and labeling.

I. Use of Respirators

When the use of respirators is required to maintain exposure below the PEL, the employer shall provide the proper respirator equipment. Respirators shall be selected and used in accordance with the requirements of 29 CFR 1910.135.

J. Recordkeeping

1. 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.
2. The employer shall assure that such records are kept, transferred, and made available in accordance with 29 CFR 1910.20.

1.2 Role of the Chemical Hygiene Plan

This Chemical Hygiene Plan describes the College of Engineering (COE) safety program, including but not limited to personal protective equipment used, control equipment inventory and operations (such as vented hoods), employee training programs, medical programs, and safety inspections. The Chemical Hygiene Plan is supplemented by safety procedural notes included in test methods used (examples: ASTM, EPA Test Methods, or Standard Methods...) The Chemical Hygiene Plan is designed as a tool to coordinate safety procedures. Every employee in the laboratory must be trained in the applicable details of this Plan.

1.3 Chemical Hygiene Plan Coverage

All employees will cooperate in complying with the provisions of the Chemical Hygiene Plan. This Plan applies to all employers involved in laboratory use of hazardous chemicals. With this OSHA standard laboratories which have and implement a Chemical Hygiene Plan are otherwise exempt from other regulations under 29 CFR 1910 Subpart Z, except for any activities which do not match OSHA's definition of "laboratory use of hazardous chemicals" even though the activity is done inside a laboratory.

2.0 DESCRIPTION OF COLLEGE OF ENGINEERING (COE)

This section establishes whether College of Engineering is a "laboratory" as defined by OSHA, which activities must comply with this standard and which others must comply with other OSHA standards, including Hazard Communication.

2.1 Description of College of Engineering Activities

Aerospace: Offering the only degree-granting aerospace program in the state and with newly added graduate-level degree programs, NMSU leads the future of aerospace engineering. Projects include systems monitoring materials behavior, biomimetrics to understand the mechanisms that allow birds and fish to generate thrust, computer simulation of structural vibrations, nanosatellites, unmanned aerial vehicles and the development of robotics to control aerospace vehicle maneuvers.

Energy: To help address the growing nationwide demand for power, we are building on our expertise in microgrids, fuel-cell technology, renewable resources and electric power systems engineering. Other areas of focus include examining ways to develop alternative sources of energy and utilize traditional fossil resources to provide cost-effective, distributed electricity to our communities. Our Institute for Energy and the Environment provides innovative research in alternative energy and water. Since 1968, our Electric Utility Management Program has been

developing students with the engineering skills and business acumen to serve as leaders in this complex industry.

Information Science: NMSU is at the forefront of this important area, with funded research in wireless networking, remote sensing, sensor networks, target recognition, speech processing, space communications and antenna design. Our strengths in information sciences draw from expertise in computer networking, communications, digital signal processing, integrated circuit design, microwave engineering and optics. In 1987, the International Foundation for Telemetering designated NMSU as the first Telemetering Center of Excellence for the study of telemetry systems, advanced communications, advanced modulation, coding, data transport and equalization techniques.

Transportation: The University has a long history of research and collaboration with industry through our Bridge Research Center, launched in 1972, which works to improve the safety and performance of bridges. The program offers the only Bridge Safety Inspection training program in the nation. This program fosters research in new technologies for improving highway safety, evaluation methods and performance.

Water: Our expertise in ensuring water quality and quantity crosses a number of disciplines and not only addresses local issues for our arid region but also has worldwide applications. As a partner in the National Science Foundation's Urban Water Engineering Research Center, we are pursuing the goal to reinvent America's aging and inadequate water infrastructure. Projects across campus include the use of algae for wastewater treatment and energy production, riparian zone management, management of urban drainage systems and development of the use of brine in landscaping.

Biomedical: Our engineers are making inroads in biomedical research across disciplines. Engineering research that earned a U.S. patent on a reduced-gravity technology used to train astronauts also has promising applications in helping people with physical disabilities or injuries offload weight for training and rehabilitation purposes. Another project introducing new technology in the standard instrumentation used in flow cytometry may open up a host of biological research applications. Yet another researcher is developing novel methods for characterization and modeling of bone structure that has important implications for the development of improved materials for surgical bone implants. Industrial engineering researchers are working toward finding efficiencies for medical delivery systems.

Manufacturing: The Manufacturing Technology and Engineering Center was established in 2000 to provide manufacturing, engineering and proof of concept and prototype refinement for businesses along with improving the technical workforce through new program development, training and outreach activities. The center leverages research facilities, expertise and statewide resources including the NMSU Engineering New Mexico Resource Network, NMSU Arrowhead Center and the New Mexico Manufacturing Extension Program.

The College of Engineering has the following departments that perform research in the areas described previously:

2.1.1 Chemical and Materials Engineering
2.1.2 Civil Engineering
2.1.3 Electrical and Computer Engineering
2.1.4 Mechanical and Aerospace Engineering
2.1.5 Industrial Engineering
2.1.6 Engineering Technology and Surveying Engineering
2.1.7 Manufacturing Technology and Engineering Center

2.2 Map of College of Engineering

The College of Engineering departments share space in several buildings on campus such as EC Complex (EC1, ECII, ECIII), Jett Hall, Gerald Thomas Hall, Skeen Hall, Thomas and Brown Hall, etc. Also a dedicated building, Goddard Hall, is used for administration. Maps of these buildings are included in Emergency Action Plans attached in Appendix C.

3.0 RESPONSIBILITIES FOR THE CHEMICAL HYGIENE PLAN (CHP)

3.1 **Chemical and Materials Engineering Department**

Personnel Responsible for Implementing the Chemical Hygiene Plan

The following personnel will be personally responsible for the following duties:

Juanita Miller, Chemical Hygiene Officer develops and updates the Chemical Hygiene Plan and appropriate policies and practices.

Phone No. 575-646-1292

Juanita Miller and/or NMSU Environmental Health and Safety Office - Provides technical assistance in complying with the Chemical Hygiene Plan and answers safety questions for employees.

Phone No. 575-646-1292 EH&S 575-646-3327

Juanita Miller - Assists project directors to develop appropriate safety precautions for new projects and procedures.

Phone No. 575-646-1292

David Rockstraw - Monitors procurement of new chemicals.

Phone No. 575-646-7705

David Rockstraw - Monitors collection and disposal of chemical wastes.

Phone No. 575-646-7705

NMSU Environmental Health and Safety Office - Remains current on developing legal rules and regulations concerning chemicals used in the College of Engineering

Phone No. EH&S 646-3327

David Rockstraw - Ensures that employees comply with the Chemical Hygiene Plan.

Phone No. 575-646-7705

David Rockstraw - Ensures the appropriate personal protective equipment is available as needed.

Phone No. 575-646-7705

David Rockstraw - Monitors proper functioning of protective equipment such as fume hoods and arranges for prompt repairs as needed.

Phone No. 575-646-7705

David Rockstraw - Performs regular chemical hygiene and housekeeping instructions.

Phone No. 575-646-6439

David Rockstraw - Performs routine inspections of emergency equipment.

Phone No. 575-646-7705

David Rockstraw - Gathers and maintains manufacturers' Material Safety Data Sheets.

Phone No. 575-646-7705

David Rockstraw - Develops and implements a labeling program.

Phone No. 575-646-7705

Juanita Miller and/or NMSU Environmental Health and Safety Office - Determines when a complaint of possible over-exposure is "reasonable" and should be referred for medical consultation.

Phone No. 575-646-1292 EH&S 575-646-3327

Juanita Miller and/or NMSU Environmental Health and Safety Office - Determines when an "Exposure Assessment" is appropriate.

Phone No. 575-646-1292 EH&S 575-646-3327

Juanita Miller and NMSU Environmental Health and Safety Office - Conducts "Exposure Assessments".
Phone No. 575-646-1292 EH&S 575-646-3327

David Rockstraw - Reviews and maintains chemical inventory.

Phone No. 575-646-7705

3.2 Civil Engineering Department

Personnel Responsible for Implementing the Chemical Hygiene Plan
The following personnel will be personally responsible for the following duties:

Juanita Miller, Chemical Hygiene Officer develops and updates the Chemical Hygiene Plan and appropriate policies and practices.

Phone No. 575-646-1292

Juanita Miller and/or NMSU Environmental Health and Safety Office - Provides technical assistance in complying with the Chemical Hygiene Plan and answers safety questions for employees.

Phone No. 575-646-1292 EH&S 575-646-3327

Juanita Miller - Assists project directors to develop appropriate safety precautions for new projects and procedures.

Phone No. 575-646-1292

Stefan Perez- Monitors procurement of new chemicals.

Phone No. 575-646-3035

Stefan Perez - Monitors collection and disposal of chemical wastes.

Phone No. 575-646-3035

NMSU Environmental Health and Safety Office - Remains current on developing legal rules and regulations concerning chemicals used in the College of Engineering

Phone No. EH&S 646-3327

David Jauregui- Ensures that employees comply with the Chemical Hygiene Plan.

Phone No. 575-646-3801

Stefan Perez - Ensures the appropriate personal protective equipment is available as needed.

Phone No. 575-646-3035

Stefan Perez - Monitors proper functioning of protective equipment such as fume hoods and arranges for prompt repairs as needed.

Phone No. 575-646-3035

Stefan Perez - Performs regular chemical hygiene and housekeeping instructions.

Phone No. 575-646-3035

Stefan Perez - Performs routine inspections of emergency equipment.

Phone No. 575-646-3035

Stefan Perez - Gathers and maintains manufacturers' Material Safety Data Sheets.

Phone No. 575-646-3035

Stefan Perez - Develops and implements a labeling program.

Phone No. 575-646-3035

Juanita Miller and/or NMSU Environmental Health and Safety Office - Determines when a complaint of possible over-exposure is "reasonable" and should be referred for medical consultation.

Phone No. 575-646-1292 EH&S 575-646-3327

Juanita Miller and/or NMSU Environmental Health and Safety Office - Determines when an "Exposure Assessment" is appropriate.

Phone No. 575-646-1292 EH&S 575-646-3327

Juanita Miller and NMSU Environmental Health and Safety Office - Conducts "Exposure Assessments".
Phone No. 575-646-1292 EH&S 575-646-3327

Stefan Perez - Reviews and maintains chemical inventory.

Phone No. 575-646-3035

3.3 Electrical and Computer Engineering Department

Personnel Responsible for Implementing the Chemical Hygiene Plan
The following personnel will be personally responsible for the following duties:

Juanita Miller, Chemical Hygiene Officer develops and updates the Chemical Hygiene Plan and appropriate policies and practices.

Phone No. 575-646-1292

Juanita Miller and/or NMSU Environmental Health and Safety Office - Provides technical assistance in complying with the Chemical Hygiene Plan and answers safety questions for employees.

Phone No. 575-646-1292 EH&S 575-646-3327

Juanita Miller - Assists project directors to develop appropriate safety precautions for new projects and procedures.

Phone No. 575-646-1292

Steve Stochaj - Monitors procurement of new chemicals.

Phone No. 575-646-3117

Steve Stochaj - Monitors collection and disposal of chemical wastes.

Phone No. 575-646-3117

NMSU Environmental Health and Safety Office - Remains current on developing legal rules and regulations concerning chemicals used in the College of Engineering

Phone No. EH&S 646-3327

Steve Stochaj - Ensures that employees comply with the Chemical Hygiene Plan.

Phone No. 575-646-3117

Steve Stochaj - Ensures the appropriate personal protective equipment is available as needed.

Phone No. 575-646-3117

Steve Stochaj - Monitors proper functioning of protective equipment such as fume hoods and arranges for prompt repairs as needed.

Phone No. 575-646-3117

Steve Stochaj - Performs regular chemical hygiene and housekeeping instructions.

Phone No. 575-646-3117

Steve Stochaj - Performs routine inspections of emergency equipment.

Phone No. 575-646-3117

Steve Stochaj - Gathers and maintains manufacturers' Material Safety Data Sheets.

Phone No. 575-646-3117

Steve Stochaj - Develops and implements a labeling program.

Phone No. 575-646-3117

Juanita Miller and/or NMSU Environmental Health and Safety Office - Determines when a complaint of possible over-exposure is "reasonable" and should be referred for medical consultation.

Phone No. 575-646-1292 EH&S 575-646-3327

Juanita Miller and/or NMSU Environmental Health and Safety Office - Determines when an "Exposure Assessment" is appropriate.

Phone No. 575-646-1292 EH&S 575-646-3327

Juanita Miller and NMSU Environmental Health and Safety Office - Conducts "Exposure Assessments".
Phone No. 575-646-1292 EH&S 575-646-3327

Steve Stochaj - Reviews and maintains chemical inventory.

Phone No. 575-646-3117

3.4 Mechanical and Aerospace Engineering Department

Personnel Responsible for Implementing the Chemical Hygiene Plan
The following personnel will be personally responsible for the following duties:

Juanita Miller, Chemical Hygiene Officer develops and updates the Chemical Hygiene Plan and appropriate policies and practices.

Phone No. 575-646-1292

Juanita Miller and/or NMSU Environmental Health and Safety Office - Provides technical assistance in complying with the Chemical Hygiene Plan and answers safety questions for employees.

Phone No. 575-646-1292 EH&S 575-646-3327

Juanita Miller - Assists project directors to develop appropriate safety precautions for new projects and procedures.

Phone No. 575-646-1292

Ruey-Hung Chen - Monitors procurement of new chemicals.

Phone No. 575-646-3502

Ruey-Hung Chen - Monitors collection and disposal of chemical wastes.

Phone No. 575-646-3502

NMSU Environmental Health and Safety Office - Remains current on developing legal rules and regulations concerning chemicals used in the College of Engineering

Phone No. EH&S 646-3327

Ruey-Hung Chen - Ensures that employees comply with the Chemical Hygiene Plan.

Phone No. 575-646-3502

Ruey-Hung Chen - Ensures the appropriate personal protective equipment is available as needed.

Phone No. 575-646-3502

Ruey-Hung Chen - Monitors proper functioning of protective equipment such as fume hoods and arranges for prompt repairs as needed.

Phone No. 575-646-3502

Ruey-Hung Chen - Performs regular chemical hygiene and housekeeping instructions.

Phone No. 575-646-3502

Ruey-Hung Chen - Performs routine inspections of emergency equipment.

Phone No. 575-646-3502

Ruey-Hung Chen - Gathers and maintains manufacturers' Material Safety Data Sheets.

Phone No. 575-646-3502

Ruey-Hung Chen - Develops and implements a labeling program.

Phone No. 575-646-3502

Juanita Miller and/or NMSU Environmental Health and Safety Office - Determines when a complaint of possible over-exposure is "reasonable" and should be referred for medical consultation.

Phone No. 575-646-1292 EH&S 575-646-3327

Juanita Miller and/or NMSU Environmental Health and Safety Office - Determines when an "Exposure Assessment" is appropriate.

Phone No. 575-646-1292 EH&S 575-646-3327

Juanita Miller and NMSU Environmental Health and Safety Office - Conducts "Exposure Assessments".
Phone No. 575-646-1292 EH&S 575-646-3327

Ruey-Hung Chen – Reviews and maintains chemical inventory.

Phone No. 575-646-3502

3.5 Industrial Engineering Department

Personnel Responsible for Implementing the Chemical Hygiene Plan
The following personnel will be personally responsible for the following duties:

Juanita Miller, Chemical Hygiene Officer develops and updates the Chemical Hygiene Plan and appropriate policies and practices.

Phone No. 575-646-1292

Juanita Miller and/or NMSU Environmental Health and Safety Office - Provides technical assistance in complying with the Chemical Hygiene Plan and answers safety questions for employees.

Phone No. 575-646-1292 EH&S 575-646-3327

Juanita Miller - Assists project directors to develop appropriate safety precautions for new projects and procedures.

Phone No. 575-646-1292

Hansuk Sohn - Monitors procurement of new chemicals.

Phone No. (575) 646-4923

Hansuk Sohn - Monitors collection and disposal of chemical wastes.

Phone No. (575) 646-4923

NMSU Environmental Health and Safety Office - Remains current on developing legal rules and regulations concerning chemicals used in the College of Engineering

Phone No. EH&S 646-3327

Hansuk Sohn - Ensures that employees comply with the Chemical Hygiene Plan.

Phone No. (575) 646-4923

Hansuk Sohn - Ensures the appropriate personal protective equipment is available as needed.

Phone No. (575) 646-4923

Hansuk Sohn - Monitors proper functioning of protective equipment such as fume hoods and arranges for prompt repairs as needed.

Phone No. 575-646-2958

Hansuk Sohn - Performs regular chemical hygiene and housekeeping instructions.

Phone No. 575-646-2958

Hansuk Sohn - Performs routine inspections of emergency equipment.

Phone No. (575) 646-4923

Hansuk Sohn - Gathers and maintains manufacturers' Material Safety Data Sheets.

Phone No. (575) 646-4923

Hansuk Sohn - Develops and implements a labeling program.

Phone No. (575) 646-4923

Juanita Miller and/or NMSU Environmental Health and Safety Office - Determines when a complaint of possible over-exposure is "reasonable" and should be referred for medical consultation.

Phone No. 575-646-1292 EH&S 575-646-3327

Juanita Miller and/or NMSU Environmental Health and Safety Office - Determines when an "Exposure Assessment" is appropriate.

Phone No. 575-646-1292 EH&S 575-646-3327

Juanita Miller and NMSU Environmental Health and Safety Office - Conducts "Exposure Assessments".
Phone No. 575-646-1292 EH&S 575-646-3327

Hansuk Sohn – Reviews and maintains chemical inventory.

Phone No. (575) 646-4923

3.6 Engineering Technology and Surveying Engineering Department

Personnel Responsible for Implementing the Chemical Hygiene Plan
The following personnel will be personally responsible for the following duties:

Juanita Miller, Chemical Hygiene Officer develops and updates the Chemical Hygiene Plan and appropriate policies and practices.

Phone No. 575-646-1292

Juanita Miller and/or NMSU Environmental Health and Safety Office - Provides technical assistance in complying with the Chemical Hygiene Plan and answers safety questions for employees.

Phone No. 575-646-1292 EH&S 575-646-3327

Juanita Miller - Assists project directors to develop appropriate safety precautions for new projects and procedures.

Phone No. 575-646-1292

Ruinian Jiang - Monitors procurement of new chemicals.

Phone No. (575) 646-2236

Ruinian Jiang - Monitors collection and disposal of chemical wastes.

Phone No. (575) 646-2236

NMSU Environmental Health and Safety Office - Remains current on developing legal rules and regulations concerning chemicals used in the College of Engineering

Phone No. EH&S 646-3327

Ruinian Jiang - Ensures that employees comply with the Chemical Hygiene Plan.

Phone No. (575) 646-2236

Ruinian Jiang - Ensures the appropriate personal protective equipment is available as needed.

Phone No. (575) 646-2236

Ruinian Jiang - Monitors proper functioning of protective equipment such as fume hoods and arranges for prompt repairs as needed.

Phone No. (575) 646-2236

Ruinian Jiang - Performs regular chemical hygiene and housekeeping instructions.

Phone No. (575) 646-2236

Ruinian Jiang - Performs routine inspections of emergency equipment.

Phone No. (575) 646-2236

Ruinian Jiang - Gathers and maintains manufacturers' Material Safety Data Sheets.

Phone No. (575) 646-2236

Ruinian Jiang - Develops and implements a labeling program.

Phone No. (575) 646-2236

Juanita Miller and/or NMSU Environmental Health and Safety Office - Determines when a complaint of possible over-exposure is "reasonable" and should be referred for medical consultation.

Phone No. 575-646-1292 EH&S 575-646-3327

Juanita Miller and/or NMSU Environmental Health and Safety Office - Determines when an "Exposure Assessment" is appropriate.

Phone No. 575-646-1292 EH&S 575-646-3327

Juanita Miller and NMSU Environmental Health and Safety Office - Conducts "Exposure Assessments".
Phone No. 575-646-1292 EH&S 575-646-3327

Ruinian Jiang - Reviews and maintains chemical inventory.

Phone No. (575) 646-2236

3.7 Manufacturing Technology and Engineering Center

Personnel Responsible for Implementing the Chemical Hygiene Plan
The following personnel will be personally responsible for the following duties:

Juanita Miller, Chemical Hygiene Officer develops and updates the Chemical Hygiene Plan and appropriate policies and practices.

Phone No. 575-646-1292

Juanita Miller and/or NMSU Environmental Health and Safety Office - Provides technical assistance in complying with the Chemical Hygiene Plan and answers safety questions for employees.

Phone No. 575-646-1292 EH&S 575-646-3327

Juanita Miller - Assists project directors to develop appropriate safety precautions for new projects and procedures.

Phone No. 575-646-1292

Charles Park - Monitors procurement of new chemicals.

Phone No. 575-646-2331

Charles Park - Monitors collection and disposal of chemical wastes.

Phone No. 575-646-2331

NMSU Environmental Health and Safety Office - Remains current on developing legal rules and regulations concerning chemicals used in the College of Engineering

Phone No. EH&S 646-3327

Charles Park - Ensures that employees comply with the Chemical Hygiene Plan.

Phone No. 575-646-2331

Charles Park - Ensures the appropriate personal protective equipment is available as needed.

Phone No. 575-646-2331

Charles Park - Monitors proper functioning of protective equipment such as fume hoods and arranges for prompt repairs as needed.

Phone No. 575-646-2331

Charles Park - Performs regular chemical hygiene and housekeeping instructions.

Phone No. 575-646-2331

Charles Park - Performs routine inspections of emergency equipment.

Phone No. 575-646-2331

Charles Park - Gathers and maintains manufacturers' Material Safety Data Sheets.

Phone No. 575-646-2331

Charles Park - Develops and implements a labeling program.

Phone No. 575-646-2331

Juanita Miller and/or NMSU Environmental Health and Safety Office - Determines when a complaint of possible over-exposure is "reasonable" and should be referred for medical consultation.

Phone No. 575-646-1292 EH&S 575-646-3327

Juanita Miller and/or NMSU Environmental Health and Safety Office - Determines when an "Exposure Assessment" is appropriate.

Phone No. 575-646-1292 EH&S 575-646-3327

Juanita Miller and NMSU Environmental Health and Safety Office - Conducts "Exposure Assessments".
Phone No. 575-646-1292 EH&S 575-646-3327

Charles Park - Reviews and maintains chemical inventory.

Phone No. 575-646-2331

3.2 Responsibilities of Each Employee

Each person working with or around chemicals, having been trained, is responsible for remaining aware of the hazards of those materials and handling those chemicals in a safe manner. Each person is responsible for knowing how to handle a hazardous chemical safely according to its types of hazards, and if that person is unsure of a hazard or safety procedure, to ASK! (see responsibilities under NMSU EH&S Policy – http://www.nsmu.edu/~safety)

Everyone shares the responsibility to ensure that all containers of chemicals are properly labeled with the identity of the chemical and its hazards.

REMEMBER: NO AMOUNT OF INSURANCE CAN CURE BLINDNESS OR RESURRECT THE DEAD! SO BE RESPONSIBLE FOR YOUR WELL-BEING.

4.0 CHEMICAL HYGIENE AND SAFETY PLAN

This section describes appropriate procedures and practices for chemical hygiene and safety.

4.1 General Standard Operating Procedures

The General Standard Operating Procedures are fundamental safety precautions which should be familiar to all employees. (additional Lab Rules are in NMSU Lab Safety Guide – see copy on EH&S website – http://www.nsmu.edu/~safety)

These practices should be followed at all times.

4.1.1 General Rules

Awareness is the most fundamental rule of chemical safety. Everyone should remain constantly aware of:

a) The chemical's hazards, as determined from the SDS and other appropriate references.

b) Appropriate safeguards for using that chemical, including personal protective equipment,

c) Location and proper use of emergency equipment.

d) How and where to properly store the chemical when not is use. (Remember: The chemical is actually used for only minutes in the average workday, the rest of the time it is being "stored" on the laboratory bench or in the fume hood.)

e) Proper personal hygiene practices.

f) The proper methods of transporting chemicals within the facility.

g) Appropriate procedures for emergencies, including evacuation routes, spill cleanup procedures and proper waste disposal.

h) Working Alone: The College of Engineering has a Working Alone Policy to address questions about laboratory operations. NEVER work alone in a laboratory, unless you have been specifically given permission to do so. Permission can be requested to work alone in a lab at https://coesafety.nmsu.edu/coe-forms/

i) Minors in Labs: The College of Engineering has a Minors in Lab Policy. NO MINORS (under age 18) permitted in lab spaces without special permission of the Department Head and COE Safety. Permission can be requested for minors to visit or work in a lab at https://coesafety.nmsu.edu/coe-forms/

4.1.2 Personal Hygiene

Personal hygiene is an important factor in chemical hygiene. To react with a person, a toxic chemical must contact that person. The four routes of entry (inhalations, ingestion, injection, and eye or skin contact) limit the chemical's ability to contact us. If we properly protect ourselves, we can eliminate the chemical's ability to do harm. Personal hygiene practices include:

a) Wash promptly if skin contact is made with any chemical, regardless of corrosivity.

b) Wear appropriate eye protection at all times.

c) Avoid inhalation of chemicals; do not "sniff" test chemicals.

d) Do not mouth pipette anything; use suction bulbs.

e) Wash well before leaving the laboratory; do not wash with solvents, use soap.

f) Change clothing as soon as possible after leaving laboratory (if no locker rooms are available) and launder work clothes often.

g) Do not eat or smoke in chemical area.

h) Do not bring food, beverage or tobacco products into chemical storage or use areas. Food, drink, and especially tobacco absorb chemical vapors and gases from the air.

4.1.3 Food and Smoking

There should be no eating, drinking or smoking allowed in areas where chemicals are either stored or used. Because chemicals vapors can be absorbed by food stuff (especially bread) and tobacco, no food or tobacco products should be allowed into chemical areas.

Instead of designating laboratory and stock areas as "No Smoking" areas, ALL areas should be considered "No Smoking" and "No Food or Beverage" except those few areas actually designated as "Smoking Permitted" and "Food and Beverage Permitted."

4.1.4 Protective Clothing and Equipment

Most personal protective equipment is provided by the College of Engineering to employees when and where necessary. It is the responsibility of each employee to be certain that the appropriate equipment is worn as necessary.

The most fundamental piece of personal protective clothing is provided by each employee for his/her own use. It is the normal clothing worn in the laboratory. Clothing should be worn to minimize exposed skin surfaces available for direct contact through splashing. Therefore, all employees should wear long sleeve/long legged clothing and avoid short sleeved shirts, short trousers or skirts.

Additional equipment available from the College of Engineering includes:

Eye wear
Lab coats
Gloves
Aprons
Face shields
Respirators

The proper uses and maintenance of the equipment is discussed in Section 4.3.5 on Control Measures.

4.1.5 Housekeeping

Common housekeeping practices contribute greatly towards chemical hygiene and safety. A clean work area is much safer than a cluttered or dirty one. Some appropriate housekeeping measures include:

- Keep all aisles, hallways, and stairs clear of all chemicals.
- Keep all work areas and especially workbenches clear of clutter and obstructions.
- All working surfaces and floors should be cleaned regularly.
- Access to emergency equipment, showers, eyewashes and exits should never be blocked by anything.
- Wastes should be kept in the proper containers and labeled properly.
- Any unlabeled containers are considered wastes by end of each workday.

Laboratory staff should be considerate and aware of housekeeping staff. The typical housekeeping staff is not as highly educated on chemicals and their hazards as most laboratory workers. Therefore, for the safety of housekeeping staff, laboratory workers should make sure that:

- All chemicals are placed in proper storage areas by the end of each workday.
- All chemical containers are labeled with both the identity of the chemical and its hazards.
- All spills are promptly cleaned up and the spilled chemical is properly disposed of.
- No chemicals are stored in aisles, stairwells, on desks or workbenches, on floors or in hallways, or left on shelves over the workbenches.

4.1.6 Prior Approval (see EH&S Prior Approval form – http://www.nsmu.edu/~safety)

Approval to proceed with a laboratory task should be obtained when:

- There is a new procedure, process or test, even if it is very similar to older practices;
- There is a change or substitution of any of the ingredient chemicals in a procedure;

- There is a substantial change in the amount of chemicals used; usually one should review safety practices if the volume of chemicals used increases by 20 or 25%;

- There is a failure of any of the equipment used in the process, especially safeguards such as fume hoods or clamp apparatus;

- There are unexpected test results. When a test result is different than the predicted, a review of how the new result impacts safety practices must be made; and

- Where members of the laboratory staff become ill, suspect exposure, smell chemicals, or otherwise suspect a failure of engineered safeguards.

Any new procedure should be subjected to peer review. Not only from a scientific standpoint, but also to assure that all safety considerations are in place prior to implementation.

4.1.7 Spills and Accidents

Spills of toxic substances or accidents involving any hazardous chemical should be resolved immediately, according to the College of Engineering (Written) Emergency Action (& Contingency) Plan (see EH&S recommendations – http://www.nsmu.edu/~safety). That plan should be attached as Appendix C. The overall steps of handling an accident are briefly:

1. Notify your supervisor and appropriate emergency responders immediately.

2. If spilled chemical is flammable, extinguish all nearby sources of ignition.

3. If a person has been splashed with a chemical, wash them with plenty of water for at least 15 minutes, remove all contaminated clothing, and GET MEDICAL ATTENTION.

4. If a person has been overexposed by inhalation, get victim to fresh air, apply artificial respiration if necessary, and GET MEDICAL ATTENTION.

5. In other cases of overexposure, GET MEDICAL ATTENTION and follow the instructions of the medical professional.

6. After securing proper medical attention for a chemical exposure victim, neutralize or absorb the spilled chemical with the proper spill cleanup material and dispose of it in accordance with hazardous wastes procedures.

For more detailed discussions on handling emergencies in the laboratory and evacuation procedures, read Appendix C.

There are some fundamental actions which must NOT be used in handling emergencies. Some of them include:

- DO NOT force any liquids into the mouth of an unconscious person.

- DO NOT handle emergencies alone, especially without notifying someone that the accident has occurred.

- DO NOT apply medical aid procedures without some training in that area

(except to wash with WATER for 15 minutes and get victim to fresh air). If you are not trained in fundamental first aid, get MEDICAL direction before inducing vomiting, giving antidotes or applying a "neutralizer" to the skin or eyes of the victim. Everyone should be trained in CPR.

- DO NOT linger at the accident scene if you are not one of the emergency responders.

4.1.8 Waste Chemicals

Chemical wastes are regulated by the Environmental Protection Agency under the Resource Conservation and Recovery Act and its amendments. Under new changes to the regulations, a Generator of hazardous wastes is now defined and regulated if the entire facility produces more than 100 KG of hazardous wastes per month, 1 kg of acute hazardous wastes, 100 kg of acute hazardous waste residues or 100 kg of contaminated soil per month.

All employees should be advised by their supervisor on how to handle wastes from their work.

4.2 Procedure-Specific Safety Procedures

Written laboratory procedures normally have a brief description of specific safety practices for that particular procedure. Employees should read and review those practices before commencing a procedure. Employees can find those written references by asking their supervisors (see EH&S recommendations – http://www.nsmu.edu/~safety)

4.3 Control Measures and Equipment

Chemical safety is accomplished by awareness of the chemical hazards and by keeping the chemical under control through a variety of engineered safeguards. Laboratory personnel should be familiar with the proper use of those safeguards. Laboratory supervisors should be able to detect the malfunction of those safeguards. All engineered controls must be properly maintained, inspected on a regular basis, and never overloaded beyond their design limits.

4.3.1 Ventilation

Laboratory ventilation should be normally not less than 20 linear feet per minute air flow through each room. This gives the workers comfortable breathing air. But 20 feet per minute translates to less than one quarter mile per hour; the flow should not be considered sufficient to prevent accumulation of chemical vapors. Work done with chemicals with low TLVs or high vapor pressures should be done in a fume hood.

Fume hoods should provide 100 to 150 linear feet per minute of air flow. When using a fume hood the worker should be aware that:

- The minimum face velocity for any exhaust hood must not be less than 100 linear feet per minute with sash in the 18" open position (2/3 closed).

- The fume hood is a safety backup device to the condensers, traps, or other devices to trap and collect the flammable or toxic vapors.

- Exhaust hood sashes must be lowered/closed to 2/3 closed position at all times except when adjusting the apparatus inside.

The apparatus inside the hood should be kept towards the rear of the hood to prevent vapors from escaping.

- The design of the hood is usually for substances of specific characteristics (e.g., venting at the top or bottom sides is for chemicals of low and high vapor density, respectively).

- Hoods are NOT storage areas.

- The vent ducts and fans must be kept clean and clear of obstructions.

- The hood must remain "on" at all times when a chemical is inside the hood, regardless whether any work is being done in the hood.

- For hoods operating with a face velocity of 100 linear feet per minute, maximum allowable decibel level of 65 dBA measured 36" away from and perpendicular to face of fume hood.

- For hoods operating with a face velocity of 125 and 150 linear feet per minute, maximum allowable decibel level of 68/70 dBA measured 36" away from, and perpendicular to, face of fume hood.

- Personnel should be aware of steps to take in case of power failure or other causes of hood failure.

Many hoods are installed to provide about 100 feet per minute (just over 1 mph). This velocity will control most low-velocity cross-drafts and the turbulence created by an occasional poor work practice at the face of hood. What is 100 fpm? Blow lightly on your hand so that you can just barely feel air movement - that's about 100 fpm.

Normal, transient, turbulent mixing velocities in laboratory air may be as high as 50 fpm, even under "good" conditions. You can see that it won't take much of a competing velocity to destroy the hood's ability to contain emissions. Here is a list of some competitors:

- cooling fans, free-standing fans;
- make-up and general HVAC room-air ventilation system supply registers;
- wind blowing through open windows and doors;
- people walking by (a person walks about 300 fpm);
- mobile equipment passing by;
- obstructions in the path of capture which create eddying, turbulence.

An upper limit - traditionally, 150 ppm - has been suggested because as the air flows into the hood, eddying around the hood worker's body tends to create a negative pressure area directly in front of the person's body. Any rapid movement of the person's arms may draw contaminated air into that space, which is also the person's breathing zone. The eddying effect becomes more pronounced as the velocity increases. The limit of 150 fpm is a upper-limit compromise between the eddying effect and the need to provide containment.

4.3.2 Safety Cans

Flammable liquids should be kept in cans specifically designed for them. The cans should be used according to manufacturer instructions and common safety practices, including:

- The cans must be kept closed except when adding or removing liquid.

- The flame arrestor screen must be kept in place at all times and replaced if punctured or damaged.

- As with all chemicals, chemicals in safety can must be stored in storage areas and not in laboratory work areas or hallways.

- All flammables must be protected against sources of ignition.

4.3.3 Flammable Storage Cabinets

Cabinets designed for the safe storage of flammable chemicals can only do so if used and maintained properly. Cabinets are generally made of double-walled construction and are made of 18 gage steel. The doors are two inches above the base and the cabinet is liquid proof to that point. Two vents are provided on opposite sides of the cabinet and are equipped with flame-arrestor screens. Always read the manufacturer's information and follow some prudent safety practices such as:

- Store only compatible materials inside the cabinet.

- Store chemicals of similar vapor density together when using mechanical ventilation (e.g., heavier than air vapors are vented through the bottom vent and lighter than air vapors through the top vent).

- Do not store paper or cardboard inside cabinets with the chemicals.

- Do not overload the cabinet.

4.3.4 Corrosive Storage Cabinets

All corrosive chemicals should be kept in cabinets especially designed to hold them. Care must be taken to separate acids from bases by distance or barrier.

4.3.5 Eyewashes and Safety Showers

Wherever chemicals have the possibility of damaging the skin or eyes, an emergency supply of water must be available. All laboratories must be equipped with eyewashes and safety showers. As with any safety equipment, these can only be useful if they can be used, therefore:

- Keep all passageways to the eyewash and shower clear of any obstacle (even a temporarily parked chemical cart).

- Eyewashes should be checked routinely (preferably daily) to be certain that water flows through it.
- Showers should be checked routinely to be assured that access is not restricted and the start chain is within reach.

- The flow through the safety showers should be tested periodically to ensure a flow of 30 gallons per minute.

4.3.6 Protective Apparel

Protective clothing was briefly discussed in Section 4.1.4 Some additional information about the use of protective clothing includes:

Gloves - Must be of a material compatible with the chemicals used. Gloves should be inflated (by whipping it in air, not by mouth inflation) to check its integrity before each use.

Safety Glasses - Should only be used when working with solid materials, such as glass blowing. Glasses should not be used with liquid chemicals.

Goggles - Form the liquid proof seal around the eyes necessary when working with liquid chemicals.

Goggles with Face Shield - For more hazardous chemicals, corrosives, and hot chemicals, both face shield with goggles must be used. The goggles protect the eyes in case splash is from side or beneath shield.

Laboratory Coat - Long sleeved coats offer the wearer minimal skin protection against minor splashes, allowing the chemical something to react with before the skin, and offering the victim time to remove the coat and shower.

Laboratory Coat and Apron - Rubberized aprons offer additional time to react to the splash than the coat alone. Arm guards should be worn when using an apron.

4.3.7 Respirators

OSHA requires all employers to primarily prevent atmospheric contamination. If that cannot keep the vapor concentrations below regulated levels, then the employer will implement a written respirator program (see 29 CFR 1910.134). The written respirator program will discuss such issues as respirator selection criteria, inspection, and maintenance. All personnel using respirators must be trained in their proper use and care. For more, detailed discussion of respirator uses and selection, see "NMSU" Written Respirator Program attached as Appendix D.

4.3.8 Vapor Detection

Because odor thresholds can be greater than the TLVs, odors are not to be used as the primary methods of vapor detection. If suspicious odors are noticed, the investigators should obtain mechanical vapor detectors, such as detector tubes or ionization meters, and respiratory protection.

4.4 Special Procedures for Carcinogens

OSHA has noted that many laboratory workers use known or suspected carcinogens. While industrial workers might use only one or a limited few chemical carcinogens, laboratory workers are likely to use many such chemicals.

Exposures to those carcinogens would at least have an additive impact on risk, if not synergistic. To limit the possible exposures, the College of Engineering has special procedures and precautions for work with carcinogens. See Appendix B for a list of carcinogens used in the College of Engineering and subject to this section.

4.4.1 Regulated and Controlled Work Areas

Special work areas are designated for work with carcinogens. The rooms, including storage areas for the chemical carcinogens, will have restricted access. Signs warning "Authorized Personnel Only" will be posted at entrances to these work areas, and if necessary, the areas will be locked. Only personnel with special instruction on

the hazards and safe handling of carcinogens will be permitted access to the areas.

The rooms where carcinogens are used and stored should be kept at a slight negative pressure when compared to the rest of the rooms.

4.4.2 Closed System Protection

All work involving carcinogens must be done in specially equipped closed systems to reduce the risks of employee exposure to the vapors. The closed systems include fume hoods, glove boxes or similar devices.

4.4.3 Handling of Contaminated Waste Waters

Rinse water and other waste waters contaminated with carcinogens are to be collected for disposal. Specific disposal procedures will be outlined by " NMSU EH&S " Hazardous Waste Officer and will be consistent with RCRA.

4.4.4 Personal Hygiene

Laboratory workers using carcinogens shall take extra precautions in maintaining good personal hygiene. In addition to hygiene practices in Section 4.1.2, workers will wash before leaving the facility.

No food, beverage or tobacco products will be permitted in the restricted areas.

4.4.5 Protection of Vacuum Systems

To protect vacuum lines and pumps, HEPA filters or high efficiency scrubber systems should be used.

4.4.6 Protective Apparel

Persons working in restricted areas should not wear any personal items such as jewelry which might be lost if decontamination is not possible. When possible, disposable clothing should be used. Gloves and long sleeves should be used at all times to prevent skin contact with the carcinogen.

4.4.7 Additional Precautions

Work with carcinogens should be done with the smallest amounts possible. Purchases of the chemicals should be restricted to minimal amounts necessary to prevent uninterrupted work.

5.0 CRITERIA FOR CONTROL MEASURES

This section examines criteria and guidelines which can or will be used to determine the use of engineered controls and personal protective equipment.

5.1 Exposure Guidelines

Most materials used have some guidelines for exposure, such as Threshold Limit Values (TLV) or Permissible Exposure Limits (PEL). When such values exist, they will be used to assist the Safety Officer or the Chemical Hygiene Officer in determining proper safety precautions, including control measures and safety apparel.

When TLV or PEL values exist and are low, the user of the chemical must use it in an

operating fume hood or if a fume hood is not available, a respirator will be used in accordance to the "NMSU" Written Respirator Program attached as Appendix D .
When TLV or PEL values are not available for that substance the Lethal Dosage information LD_{50} will be assessed. If that is low, then the chemical must also be used in a fume hood if possible, or a respirator must be used.

Whenever the chemical has a high vapor pressure, meaning that it evaporates quickly at room temperature, it will be used in a fume hood or else respiratory protection is needed. Those controls are necessary even if the chemical with the high vapor pressure also has a very high TLV or LD_{50}, because such chemicals are likely to reach their exposure limits in air at least as quickly as a chemical with low exposure guidelines and a low vapor pressure.

Fume hoods or respirators will be used when: (* see EH&S recommendation)

- The TLV or PEL is below ppm or mg/m^3 limits as shown in **29 CFR 1910.1000**
- The LD_{50} is below **50** mg/kg of body weight
- The vapor pressure is above **100** mm Hg at 20° C.

5.2 Fire Guidelines

In general, a flammable chemical is determined by its flash point, the lowest temperature at which an ignition source can cause the chemical to ignite momentarily. Although the lowest temperature at which the chemical will catch fire with an ignition source is called the "fire point," it is rarely more than one or two degrees greater than the "flash point." Therefore, the flash point will be used as the reference of "fire hazard" here at the College of Engineering.

OSHA and NFPA have guidelines on when a chemical is considered flammable. Those guidelines are herein adopted for use in the laboratory.

"Flammable" is generally used to refer to chemicals with a flash point below 100 degrees Fahrenheit (F). Chemicals with flash points between 100 and 200°F are termed "Combustible". Combustible chemicals have caused buildings to burn down; therefore, any chemical with a flash point below 200°F will be considered a "fire hazard" and will be stored in a flammable solvent storage area or flammable storage cabinet. They will be used in a vented fume hood, away from source of ignition.

More detailed discussions on fire hazards can be found in OSHA's regulations (29 Code of Federal Regulations 1910) and your local fire codes.

5.3 Reactivity Guidelines

While NFPA has developed some guidelines on what constitutes a reactive chemical, their emphasis is centered on a fire emergency.

Other guidelines on which chemicals are reactive can be found in regulations from the Department of Transportation (49 CFR) and the Environmental Protection Agency (40 CFR).

At the College of Engineering, a reactive chemical is one which is:

- Ranked by NFPA as 3 or 4 for reactivity.
- Determined by the U.S. D.O.T. as either:
- An oxidizer
- An organic peroxide
- An explosive (Classes A, B, or C)
- Fits the U.S. EPA definition of reactive in 40 CFR 261.
- Fits the OSHA definitions of unstable or polymerizable.
- Is found to be reactive with ordinary substances.

Once a chemical has been determined to be reactive, all proper safety precautions will be used including extra segregation in storage and prohibition on mixing with other chemicals without appropriate personal protection and precautions.

5.4 Corrosivity and Contact Hazards

A corrosive chemical is defined by OSHA, DOT, and EPA. So the College of Engineering will consider a chemical corrosive if it fits the definition of corrosive found in regulations by:

- OSHA (29 CFR)
- DOT (49 CFR)
- EPA (40 CFR)
- or it has a very low or very high Ph.

A skin or eye contact hazard chemical is one where the chemical's route of entry for its toxic effects is through the skin or eyes. Chemicals which are contact hazards will be determined by examining medical and industrial hygiene literature.

6.0 EXPOSURE EVALUATIONS AND MEDICAL CONSULTATIONS

This section discusses the reasons for performing a formal evaluation of suspected exposures, the documentation of such, and arrangements which should be made with medical professionals. This section MUST be tailored by the College of Engineering and the following information is presented to supplement, not replace, your own criteria for evaluation and agreements with local medical professionals.

6.1 Suspected Exposures to Toxic Substances

There may be times when employees suspect that they have been exposed to some toxic substance in the laboratory. It is up to the College of Engineering management to develop criteria which will help determine if the suspicion is reasonable. If the circumstances surrounding the complaint are determined to cause a reasonable suspicion of exposure to a chemical, then a designated responsible and unbiased individual in the College of Engineering will initiate actions to formally evaluate the complaint.

6.1.1 Example Criteria of "Reasonable" Suspicion of Exposure

The following are examples of some events or circumstances which the College of Engineering might reasonably consider as evidence that an exposure to toxic substances is likely:

- Victim had direct skin or eye contact with a chemical substance.
- Odor was noticed, especially if person was working with any chemical which has a lower TLV than odor threshold.
- Manifestation of health hazard symptoms such as headache, rash, nausea, coughing, tearing, irritation or redness of eyes, irritation of nose or throat, dizziness, loss of motor dexterity or judgement which resemble drunkenness, etc.
- Some or all symptoms disappear when person is taken away from chemical area and into fresh air.
- Symptoms previously complained about reappear soon after person starts working with chemicals again.
- Complaints are received from more than one person in the same work area.

- It should be the College of Engineering policy to promptly investigate ALL complaints to determine risk of employee overexposure to the toxic substance in their work place.

6.2 Exposure Evaluations

Once a complaint of possible hazardous chemical exposure has been received, the complaint should be documented in a short memo along with the decision of appropriate action. If it was decided that no further evaluation of the event is necessary, the reason for that decision should be included in the document. If a decision is made that the complaint should be investigated, then a formal Exposure Evaluation will commence.

6.2.1 Steps of Exposure Evaluation

The actual steps of the Exposure Evaluation will have to be determined by a responsible person or persons in the College of Engineering, preferably with the assistance of a qualified safety professional or Industrial Hygienist. Some steps that might be considered (but not limited to) include:

1. Interviewing the person initiating the complaint, and the victim if it is not the same person.

2. Listing essential information about the circumstances of the complaint including:
   - Chemical of suspicion
   - Other chemical in use by victim
   - Other chemicals being used by others in the immediate area.
   - Other chemicals stored in that area.
   - Symptoms
   - How symptoms compare to information in the Material Safety Data Sheets for those chemicals in the area.
   - Were control measures, such as fume hoods and personal protective equipment, used and used properly?
   - Are any air sampling or monitoring devices in place or available?

NOTE: The use or failure to use personal protective equipment, control measures and follow Standard Operating or Safety Procedures might contribute to the cause of overexposure. It is not the Exposure Evaluator who places blame for the vent. Blame, if appropriate, should come much later and from a different source than the exposure investigator. THE PURPOSE OF THE EXPOSURE EVALUATION IS TO DETERMINE IF ANY EXPOSURE HAS TAKEN PLACE; NOT TO ASSIGN BLAME.

3. Air sampling of the area for suspect chemicals.

4. Determining how the symptoms compare to the information on the SDS.

5. Deciding whether to send victim for medical evaluation.

6. Review of the adequacies of present control measures and safety procedures.

The employees must be notified of the results of any monitoring within 15 days of receipt of those results.

6.3 Medical Consultation

When employees are suspected or known to be overexposed to toxic chemicals, they should receive prompt medical attention. To ensure that they do receive proper and informed medical attention, the College of Engineering should contract medical professional who is experienced in treating victims of chemical overexposure. The contracted medical professional should also be knowledgeable about which tests or procedures help determine if there has been an overexposure (techniques called "Differential Diagnosis").

6.3.1 Medical Consultation

It is authority of the **College of Engineering Safety Specialist** to authorize medical consultation in Non-Emergency cases.

The person who will be examined will visit "Campus Health Center", 3080 Breland Dr, Las Cruces, NM 88003 (575) 646-1512.

It is the responsibility of Dean of the College of Engineering, through the departmental CHO or other designee, to arrange for the transportation of the person to be examined to and from the medical center (NOTE: if chemical exposure is confirmed or suspected, the College of Engineering cannot assure that the victim can properly operate a motor vehicle).

The medical report will be sent directly to Campus Health Medical Director (Dr. Ben Diven, MSC 3529, bdiven@nmsu.edu) and he will pass the appropriate information along to those involved.

6.3.2 Medical Consultation Contract and Capabilities

Appendix E has a copy of the Contractual Agreement and the Statement of Qualifications of our medical consultant.

6.4 Documentation

All memos, notes and reports related to a complaint of possible exposure to toxic substances must be maintained in a file for easy retrieval with a cross-reference in the victim's personnel file. For more on reports and recordkeeping, see Section 8.0.

6.5 Notification

The employee shall be notified of the results of any medical examination with regard to any medical condition which might exist from overexposure to a chemical.

7.0 EMPLOYEE INFORMATION AND TRAINING

This section incorporates the minimal informational requirements of the OSHA Standard with suggestions for making an employee informational and training program effective. To see the minimum regulatory requirements, see Appendix A.

7.1 Informational Requirements

OSHA has required that employees be informed of:

- The existence, location and availability of this document (the Chemical Hygiene Plan).
- 29 CFR 1910.1450 and its appendices.
- The criteria to select, use and the limits of personal protective equipment.

- Exposure limits including TLV and PEL.
- The emergency procedures and the location of the equipment.
- The location of available reference materials including the Material Safety Data Sheets.

Information does not need to be a formal training session in a classroom setting. Information can be from informal group or individual discussions with one's supervisor, posted notices, or handout booklets. OSHA has not shown interest in how the employees learn this information, but if asked by an OSHA inspector, the employees must be able to answer those issues accurately.

7.2 Preparing the Tools of Training Program

Although OSHA allows the information to be passed to employees in a non-classroom setting, formal training remains one of the best methods to ensure that all employees understand that safety is an issue to take seriously. There are many commercially available training aids with which your designated trainer can prepare a very comprehensive program.

Training aids available include:

- "Canned" programs designed by commercial concerns and professional organizations.
- Slides on specific topics or problems; books and booklets on safety matters.
- Overheads, books, slides, etc., prepared by your own company.

"Canned" Versus "Live" Programs

An employer may wish to compare the advantages and disadvantages of training programs involving live speakers versus taped presentations. The following table illustrates some of the advantages and disadvantages of each.

COMPARISON OF LIVE/CANNED TRAINING PRESENTATIONS

LIVE	CANNED
Speaker can answer questions in relation to the course material and lab situation.	Canned programs cannot address audience questions.
Classes can be altered to the audience's situations.	Canned programs are not flexible in content.
Speakers can adjust to audience to ensure attentiveness.	Bored audience may ignore program.
Speakers bring special expertise with them.	One has to buy a program to evaluate it.
Lost or missed attendance is a large problem.	Canned programs may be used often so missed schedules and attendance is not a problem.
The contents of live presentations must somehow be documented.	Canned programs are self-documenting.

7.3 Development of a Training Program

A training program should be fully developed before it is presented. There are numerous suggestions available for course development. One suggestion comes from OSHA (Federal Register Vol. 49 No. 146, Friday, July 27, 1984, Pages 30290-30294). OSHA Training Guidelines.

OSHA developed training guidelines which are divided into seven steps:

1. Determine if the training is needed.
2. Identify the training needs (who, what, when).
3. Identify the goals and objectives.
4. Develop learning activities.
5. Conduct the training.
6. Evaluate the program's effectiveness.
7. Improve/Supplement the program as necessary.

7.3.1 Determine if the Training Program is Needed

As with any major project, it is necessary to determine whether the program is necessary. In this case, the necessity is a regulatory one and not something which could be considered optional. To conserve the costs of training, it would be valuable to determine if there are any other training needs which are compatible with the OSHA training. For example, EPA's hazardous wastes regulations mandate that any employee involved with hazardous waste management must be trained on the hazards, which are very similar to OSHA's training requirements.

7.3.2 Identify the Training Needs

The regulatory contents of the training program have already been outlined. Other needs should be identified, including:

- Who has to be trained and on which topics.
- When to best do the training.
- How shall the training be done (the best format for the audience).
- Which topics should receive the most emphasis.

7.3.3 Identify Goals and Objectives

Training has many possible options and details to review. There are many safety topics which could be discussed. There are so many details, in fact, that it is possible to forget why the program is taking place. Remember that the Laboratory Standard training program is primarily for discussions on chemical safety and how the labels and Material Safety Data Sheets can improve safety, if properly used.

One special objective of any chemical safety course is that hazardous chemicals can be handled safely. Special safeguards may have to be used when handling a chemical, however, the chemical can ultimately be handled safely. This theme of safety might be repeated several times in the program.

7.3.4 Develop Training Program

Developing the training program can be simplified by using existing systems, shows and programs for common safety issues such as flammable or corrosive chemical safety. Some parts may have to be tailor-made for a unique situations if, for example, the company uses an internal labeling system on containers or an internal SDS in place of those provided by manufacturers.

7.3.5 Conduct the Training

There may be some special problems to anticipate when conducting the training such as:

Scheduling - How to make sure everyone is trained, even those who are on vacations.

Questions - How to address the audience's questions both during and especially after the training sessions.

7.3.6 Evaluate the Program's Effectiveness
Because OSHA's enforcement of training is by a Performance Standard (meaning how well the people remember what was discussed as opposed to whether they attended the class), testing of some sort should be given after each program to ensure that everyone understands what was discussed.

Documentation of everyone's attendance in the program can help somewhat in proving to OSHA that the training did take place, but the OSHA inspector may request some other proof of the program's effectiveness.

7.3.7 Improve/Augment the Program

If necessary, the training program could be improved, updated, or added to. The way of determining that requirement is to have an active way of testing or evaluating the program's effectiveness.

7.3.8 Training Under 29 CFR 1910.1450
Training under 29 CFR 1910.1450 must include the following:

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.

(ii) The employee shall be trained on the applicable details of the employer's written Chemical Hygiene Plan.

(See p. 3329, January 31, 1990, Section f, 4, i of Federal Register Volume 55, No. 21.)

8.0 RECORDS AND RECORDKEEPING

This section reviews the value of documenting compliance with this safety standard, not just for OSHA's information, but for general liability and the ability to periodically access the safe conduct of employees.

8.1 Records
Specific records may be required in the event of lost work time resulting from an exposure or accident on the job. The standard form **OSHA 300** is used to document lost workdays from incidents that occur at work. Contact your OSHA office to determine which forms and

documents must be kept.

In addition to records required by OSHA, it might be desirable to keep special records developed internally which document suspected exposures and employee exposure complaints regardless of the outcome of the Exposure Evaluation. Other incidents and activities could be documented for future reference. Some examples of desirable records include:

- Complaints from Employees - Even if the complaint is found to be unjustified, it is desirable to keep a record of the complaint, the investigation, and the outcome. The complaints might be about chemical exposure, but could include complaints about inoperative engineered controls or defective personal protective equipment.

- Repair and Maintenance Records for Control Systems - Demonstrate that equipment such as fume hoods are well maintained and kept in proper operating order.

- Major Safety Suggestions from Employees - Can be valuable to improve laboratory safety. Even if the issue is decided to be non-workable, the fact that the suggestion was taken seriously and examined is valuable.

8.2 Recordkeeping

All records should be kept for at least as long as the employees affected are employed at the facility. OSHA requires some records to be kept for 30 years beyond the employee's time of employment. It is prudent to develop an archiving system to keep all important documents related to safety employee training and distribution of Material Safety Data Sheets for the lifetime of the company.

The Laboratory Standard requires that records be maintained of all Exposure Evaluations, Medical Consultations and reports, and that those records be maintained in accordance to 29 CFR 1910.20. That section requires those records to be maintained for at least 30 years and describes the accessibility of the records.

Remember that depending on the task and activity, there can be special recordkeeping requirements from OSHA, EPA, or other Federal and State agencies.

The following appendices are not included in the model plan, but should be made part of your Chemical Hygiene Plan.

- Appendix A: OSHA's Lab Standard Regulations (29 CFR 1910.1450)
  'Research Council Recommendations' (29CFR1910.1450 app.A)
  References on Chemical Hygiene' (29CFR1910.1450 app B)
- Appendix B: List of Carcinogens at the College of Engineering maintained by NMSU EHS 646-3327
- Appendix C: Emergency Action Plans

Building	Department
Goddard Hall	College of Engineering, Administration
Wells Hall	Mechanical and Aerospace Engineering
Thomas & Brown	Electrical and Computer Engineering, Chemical and Materials Engineering
Photovoltaic Lab	Mechanical and Aerospace Engineering
ECI	Engineering Research Center, Civil Engineering
ECII (Hernandez Hall)	Civil Engineering
ECIII (Foreman Engineering Complex)	Engineering Technology and Surveying Engineering, Industrial Engineering, Manufacturing Technology and Engineering Center
Leyendecker Plant Science Research Center	Chemical and Materials Engineering
Goddard Hall Annex	Electrical & Computer Engineering
Jett Hall	Chemical and Materials Engineering, Mechanical

	Engineering

- Appendix D: NMSU Respiratory Program, if needed:
  http://safety.nmsu.edu/programs/industrial_safety/NMSU_Respirator_Program.pdf
- Appendix E: *Campus Health Center*, *3080 Breland Dr, Las Cruces, NM 88003* and (*575)646-1512*
- Appendix F: List the College of Engineering safety references and locations for SDS Sheets – Hard copy maintained in each lab space
- Appendix G: Spill Control Plan (Slug Control Plan) signage to be posted by sanitary drains
  http://safety.nmsu.edu/programs/chem_safety/NMSU-WSCProg.pdf