

6.08 BENZENE SAFETY PROGRAM

The purpose of this program is to protect employees from the hazards associated with benzene and maintain benzene exposures below the regulatory limits.

A. SCOPE

This program applies to all locations at UNM that use benzene or benzene-containing solutions. It does not apply to the storage, dispensing, sale or use of gasoline, motor fuels or other fuels containing benzene.

B. RESPONSIBILITIES

1. The Department of Safety and Risk Services (SRS) is responsible for:
 - developing and implementing a University-wide program;
 - monitoring compliance with the OSHA Standard-29 CFR 1910.1028;
 - providing general Benzene Safety training;
 - conducting exposure assessments and evaluating exposure control measures as necessary;
 - investigating accidents; and
 - maintaining employee exposure records.
2. Deans, Directors and Department Heads are responsible for:
 - ensuring departmental compliance with all the procedures outlined in this program.
3. Supervisors' responsibilities include:
 - ensuring compliance with this program in their work areas;
 - developing Standard Operating Procedures that address specific safety measures to be implemented when using benzene;
 - coordinating the provision of medical examinations, monitoring exposure, and recordkeeping, as required;
 - ensuring employees with potential exposure to benzene receive the appropriate training prior to working with the substance;
 - arranging for immediate emergency response, if necessary, for chemical spills, injuries and overexposures;
 - maintaining a MSDS for the benzene products used and all other hazardous chemicals in the work area; and
 - notifying SRS when there is a change in equipment, processes or controls which may result in additional exposure to benzene.

4. Employees/students are required to:
 - know the provisions of the Benzene Safety Program;
 - report accidents, possible overexposures or unsafe conditions to their supervisor;
 - wear Personal Protective Equipment and use engineering controls when recommended and provided.

C. HAZARD DATA

Benzene exposure has been associated with aplastic anemia and blood cancer. Benzene can affect the human body through inhalation, skin/eye contact or accidental ingestion. Benzene has a pleasant, sweet odor, but the odor does not provide adequate warning of its hazard. The dose, or amount of exposure, determines the type and degree of beneficial or adverse health effects.

1. Acute Health Effects

Inhalation. Exposure to high concentrations of benzene may cause breathlessness, irritability, euphoria, headache, dizziness, nausea, intoxication or giddiness. It may cause severe irritation of the eyes, nose and respiratory tract. Severe exposures can lead to convulsions and loss of consciousness. Aspiration of small amounts of liquid benzene into the lungs immediately causes pulmonary edema and hemorrhage of pulmonary tissue.

Skin Absorption/Eye Contact. Contact with benzene may cause severe irritation of the skin and eyes. Benzene can be absorbed into the skin and cause dermatitis and erythema. Direct eye contact may result in temporary corneal damage.

Ingestion. Benzene ingestion may cause nausea, vomiting, headache, dizziness and gastrointestinal irritation.

2. Chronic Health Effects

Chronic effects are various blood disorders, ranging from aplastic anemia to leukemia (blood cancer) that may appear over a relatively long periods of time, usually after repeated and prolonged exposure to benzene above the OSHA permissible exposure limit (PEL). Benzene has been linked by OSHA to the potential causation of cancer in humans, such as myeloid leukemia, acute lymphocytic and/or myelogenous leukemia, hairy cell leukemia, myelodysplastic syndrome, Hodgkin's disease and lymphomas. The hematopoietic (blood forming) system is the chief target for benzene's chronic toxic effects which are manifested by alteration in the levels of formed elements in the peripheral blood.

3. Physical Hazards

Benzene poses a serious fire and explosion hazard when exposed to heat or flame. Benzene vapor is heavier than air and may collect in low areas. Vapors can also travel for some distance

and may come into contact with ignition sources. The flame may then be propagated along the vapor trail back to the source and cause an explosion.

D. PERMISSIBLE EXPOSURE LIMITS

OSHA has issued several types of limits for employee exposures to trigger various regulatory requirements. These are specified as the action level (AL), the 8-hour time-weighted average permissible exposure limit (PEL), and the short-term exposure limit (STEL).

Action Level – A limit defined as 0.5 part benzene per million parts of air (0.5 ppm),, calculated as an 8-hour time-weighted average. If employees are exposed at or above this concentration for more than 30 days per year, OSHA mandates that employers initiate certain required activities such as annual exposure monitoring and medical surveillance.

Permissible Exposure Limit (PEL) - A limit defined as one part benzene per million parts of air (1 ppm), calculated as an 8-hour time-weighted average. If employees are exposed at or above this limit, OSHA mandates that employers are required to provide protective equipment such as respirators, must study and install engineering controls, if feasible, establish regulated areas, and perform all other OSHA-required procedures and duties.

Short Term Exposure Limit (STEL) - The STEL limit is defined as 5 parts benzene per million parts of air (5ppm) averaged over any 15-minute period. Any exceedance of this limit also triggers all the OSHA requirements prescribed for exceedances of the PEL.

E. EMPLOYEE EXPOSURE ASSESSMENTS

Whenever benzene is used in a work area, SRS will monitor the air to determine employee exposures. Measurements of employee exposures will be representative of a full shift or STEL, and will be taken for each job classification in each work area.

If employee exposures are found to be at or above the action level but below the PEL, SRS will repeat air monitoring annually. If exposures are above the PEL, air monitoring will be conducted every 6 months. If exposures are above the STEL, air monitoring will be conducted at least once per year. Monitoring will continue until exposures can be reduced below these levels by engineering or administrative controls.

Air monitoring will be conducted promptly in a work area if employees are experiencing signs or symptoms of benzene exposure. Air monitoring will be repeated in an area each time there is a change in equipment, processes or controls which may result in additional exposure to benzene. SRS must be notified to conduct this monitoring.

F. REDUCING EMPLOYEE EXPOSURE TO BENZENE

1. Substitution

When possible, substitution of a less hazardous chemical or process will be used to reduce or eliminate benzene exposures.

2. Engineering Controls

When possible, chemical fume hoods and/or local exhaust ventilation will be used to reduce exposures to benzene. Local exhaust is used to capture and exhaust benzene vapors from the worksite, thereby preventing the accumulation of high exposure levels in the employee's breathing zone.

3. Administrative Controls

If engineering controls cannot be implemented, alteration of work practices will be used to reduce exposures to benzene. This could include limiting the amount of time employees spend working in high exposure areas by rotating personnel.

4. Personal Protective Equipment (PPE)

Contact with the eyes or skin with liquids containing benzene will be prevented by the use of protective garments and equipment which are impervious to benzene. Of the various materials tested, it has been determined that PVC is the most resistant to penetration by benzene. The type of Personal Protective Equipment (PPE) necessary will vary depending on the concentration, amount used and the potential for splashing. It may include goggles, face shields, gloves, gowns, lab coats, aprons and arm sleeves. SRS can provide you with guidance on the appropriate PPE for your area.

Respirators. If employee exposures are found to exceed the PEL or STEL, respirators will be provided until feasible engineering or administrative controls can be implemented. Respirator use and type will be determined by SRS, based on air monitoring results. If respirator use is necessary, employees must be medically cleared by Employee Occupational Health Services (EOHS) to wear a respirator, and fit-tested and trained by SRS personnel before using a respirator.

In areas where the benzene concentration is unknown or greater than 1,000 ppm, full body protective clothing and Self-Contained Breathing Apparatus (SCBA) or supplied air respirators are required. This concentration may be encountered during a large quantity spill of benzene. **Currently, no UNM personnel are trained to handle this type of situation; Campus Police must be contacted in these situations (911 - landline phones and 277-2241- mobile phones).**

All Personal Protective Equipment must be inspected by employees prior to each use. Personal Protective Equipment must be stored in a clean and sanitary manner. Respirators should be inspected by supervisors each month to ensure they are being used, stored and cleaned properly.

5. Hygiene

To prevent the accidental ingestion of benzene, eating, drinking and smoking are prohibited in areas where benzene is used. In addition, employees must wash their hands after using benzene.

Protective clothing contaminated with benzene must not be taken home by employees. Arrangements must be made by the department to have all reusable protective clothing laundered.

6. Emergency Eyewash and Shower

If there is a possibility that an employee's skin may be splashed by benzene containing solutions, an emergency shower or drench hose should be provided in the work area. If there is a possibility that an employee's eyes may be splashed by benzene containing solutions, a plumbed eyewash station should be provided in the work area. Employees must be instructed on the proper use of the eyewash and emergency showers. If an employee's eyes or skin are splashed by benzene containing solutions, the employee must flush them immediately and continue to do so for at least 15 minutes. Employees should then seek medical attention.

G. SIGNAGE AND LABELING

1. Regulated Areas

Areas where the airborne levels of benzene are found to exceed the PEL's will be designated as regulated areas. Access to these areas will be limited to persons trained to recognize the hazards of benzene. All entrances and accessways will be posted with signs bearing the following information:

DANGER
Benzene
Cancer Hazard
Flammable
Authorized Personnel Only
Respirator Required

2. Container Labels

If a chemical product containing benzene is transferred into a container other than the original, it must be labeled with the following information:

DANGER
Contains Benzene
Cancer Hazard

SRS will provide these labels upon request.

When labeling containers following the University's labeling policy, use the following hazard ratings: **Health-3, Flammability-3, Reactivity-0** and **Personal Protective Equipment**-this rating will vary based upon the use, but must be at least a B rating from the Lab Safety Supply Hazardous Material Identification Guide. Refer to SRS's Hazard Communication Program (Section 4.05 in the Safety and Risk Services Manual) for more information.

H. STANDARD OPERATING PROCEDURES (SOP)

Working with benzene requires a written Standard Operating Procedure that addresses the following:

- the hazards of benzene;
- what containment devices (i.e., chemical fume hoods, glove boxes) will be used when working with benzene;
- what Personal Protective Equipment is required;
- designated storage and use areas;
- how to dispose of waste benzene solutions; and
- decontamination and spill clean-up procedures.

A SOP template is provided in Attachment A.

I. EMPLOYEE INFORMATION AND TRAINING

Every employee working with benzene must receive training on its hazards. A training module will be provided to supervisors who have employees working with benzene. Supervisors should review this information with employees annually. This information contains the following:

- requirements of the OSHA Standard-29 CFR 1910.1028;
- explanation of UNM's Benzene Safety program;
- contents of the Material Safety Data Sheet;
- description of the medical surveillance program;
- description of the health hazards associated with exposure;
- signs and symptoms of exposure;
- instructions to report any signs or symptoms that may be attributable to benzene exposure;
- description of the operations in the work area where benzene is present;
- work practices to reduce exposure, including engineering and administrative controls and Personal Protective Equipment required; and
- instructions for handling spills and emergency procedures.

This training must be conducted whenever a new hazard is introduced into the work area, when the employee transfers to another job, a change in procedures, and whenever the employee demonstrates behavior that indicates a lack of understanding of the safe handling of chemicals.

Supervisors are responsible for ensuring that employees with potential exposure to benzene receive the appropriate training *prior* to working with the substance. To ensure that supervisors are knowledgeable of their training responsibilities, SRS will conduct train-the-trainer courses as necessary and provide training modules for all supervisors.

All training must be documented by the individual presenting the training session and a copy of the training records will be submitted to SRS.

J. MEDICAL SURVEILLANCE

Employees found to have benzene exposures that exceed the benzene action level for 30 or more days per year or above the PEL and/or the STEL for ten or more days per year, will be included in a medical surveillance program. These employees will complete a medical questionnaire annually and receive a physical examination by EOHS. The physical will include blood tests to determine if any blood disorders may exist.

Employees exposed to benzene must receive medical attention under the following circumstances:

- whenever an employee has developed signs or symptoms associated with exposure to benzene; and/or
- whenever an employee is involved in a spill, leak or other occurrence resulting in a possible overexposure to benzene.

Employees may obtain free medical consultation regarding concerns about benzene exposures by contacting EOHS at 272-8043. Students with concerns about chemical exposures should contact Student Health Services at 277-3136.

It is the intent of the University to provide a work environment which does not compromise the reproductive health of any employee or student, regardless of gender, or the health of a fetus. Counseling on reproductive health matters may be obtained by contacting EOHS or Student Health Services.

Employees that are required to wear respirators, as determined by SRS, must be medically cleared by EOHS to use a respirator.

Medical Removal. If any of three specific blood abnormalities are found as a result of blood tests, the employee will be referred to a hematologist or internist by EOHS. The employee shall also be removed from work areas where benzene exposures exceed the action level, PEL or STEL for the duration recommended by the physician and hematologist. If EOHS determines

that the symptoms may be the result of a possible overexposure, SRS will evaluate the work area to determine if further control measures are necessary.

K. SPILLS

Please refer to Chemical Spill Response Program (Section 4.02 in the Safety and Risk Services Manual) for detailed information.

Laboratory personnel can clean up the vast majority of chemical spills that occur in the lab. **The individual(s) who caused the spill is(are) responsible for prompt and proper clean-up.** It is the responsibility of the supervisor and/or chemical safety officer to have spill control clean-up materials and personal protective equipment, which are appropriate for the chemicals being handled, readily available. Supervisors are also responsible for ensuring that spills are cleaned up as soon as possible. The types and quantities of hazardous chemical substances used on the UNM campus require preplanning in order for accidental chemical releases to be handled in a safe manner.

Minor Spills. The appropriate Personal Protective Equipment, such as safety glasses and benzene resistant gloves, must be used to prevent skin contact with the benzene. The appropriate respirator must be used to minimize inhalation of the benzene vapors. The spill clean-up materials must be double-bagged, tightly closed, labeled and picked up by SRS for disposal. The disposal of spill clean-up materials is the sole responsibility of the SRS staff, who may be contacted at 277-2753.

Major Spills. Employees should not attempt to clean up large quantity spills (more than 5 gallons) of benzene, particularly in confined or restricted spaces, unless special training has been received, appropriate spill cleanup materials are available in a spill clean-up kit, and personal protective equipment are readily available. If you experience any symptoms of exposure while cleaning up the spill, stop immediately and call 911 from a landline or 277-2241 from a mobile phone, for assistance. Campus Police will contact SRS to assist you with clean-up. If an area contains large quantities of benzene, procedures to be followed in the case of an emergency must be included as part the Standard Operating Procedures for benzene in that area. All employees should be trained in proper spill cleanup procedures. Otherwise, in the event of a very large or major spill for which you are not properly trained or prepared, evacuate the area and call 911 from landline or 277-2241 from a mobile phone.

L. DISPOSAL

All chemical waste must be disposed of according to the Hazardous Chemical Waste Program (Section 4.07 in the Safety and Risk Services Manual). This document must be referenced before any chemical is disposed of into the trash, into the sewer or allowed to evaporate. Benzene containing wastes shall be placed in a labeled waste container in a flammable storage cabinet. When in doubt, contact SRS at 277-2753 for clarification.

M. STORAGE

Benzene should be stored in a flammable storage cabinet in an unbreakable, chemically resistant secondary container to contain spills. Benzene should not be stored with acids or oxidizing agents. Benzene is classified as a Class 1 B Flammable liquid for the purpose of OSHA regulation 29 CFR 1910.106. Refer to the Chemical Storage Program (Section 4.03 in Safety and Risk Services Manual) for more details.