



ENVIRONMENTAL  
HEALTH & SAFETY

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**BENZENE SAFETY PROGRAM**

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## DOCUMENT REVISION LOG

Document: **Benzene Safety Program**

Rev. No.	Effective Date	Revision Description	Pages Replaced	Completed by:
1	04/06/2020	Periodic revision	General updates on many pages	M. Terry
2	02/15/2021	Updated with new name of Department and key personnel	NA	M. Terry

## ACRONYMS & DEFINITIONS

Action Level (AL)	Level of exposure to a harmful substance or other hazard (present in a work environment or situation) at which an employer must take the required precautions to protect the workers.
Permissible Exposure Limit (PEL)	A legal/regulatory limit for exposure of an employee to a chemical substance or physical agent. The PEL for benzene is 1 ppm.
Short Term Exposure Limit (STEL)	The maximum concentration of a chemical to which workers may be exposed continuously for up to 15 minutes without danger to health or work efficiency and safety. The STEL for benzene is 5 ppm.
CFR	Code of Federal Regulations
EHS	Environmental Health & Safety Department
EOHS	Employee Occupational Health Services
ml	Milliliters
OSHA	Occupational Safety & Health Administration
PPE	Personal Protective Equipment
ppm	Parts per million
SDS	Safety Data Sheet
SOP	Standard Operating Procedures

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## Benzene Safety Program

This document establishes University of New Mexico's written compliance program for benzene, as required by the Occupational Safety and Health Administration (OSHA) under Title 29 Code of Federal Regulations (CFR) Part 1910.1028 (The Benzene Standard). The purpose of this program is to identify work activities and personnel with potential for exposure to benzene and to ensure that benzene is handled safely.

### 1. SCOPE

This program applies to all employees at the University of New Mexico (UNM) who use benzene.

### 2. RESPONSIBILITIES

#### 2.1. Environmental Health & Safety (EHS) is responsible for:

- Preparing, reviewing and periodically revising this program
- Monitoring compliance with this program
- Providing general benzene safety training
- Conducting exposure assessments and evaluating exposure control measures
- Providing or coordinating emergency response for chemical spills
- Investigating accidents
- Maintaining employee exposure records

#### 2.2. Deans, Directors, and Department Heads are responsible for:

- Ensuring departmental compliance with all the procedures outlined in this program

#### 2.3. Supervisors and/or PI's are responsible for:

- Ensuring compliance with this program in their work area(s)
- Developing Standard Operating Procedures (SOPs) that address the specific safety measures to be implemented when using benzene
- Ensuring employees with potential exposure to benzene receive the appropriate training before working with it
- Coordinating the provision of medical examinations, exposure monitoring and record keeping
- Arranging for immediate emergency response, if necessary, for chemical spills, injuries and overexposures
- Maintaining a Safety Data Sheet (SDS) for benzene products and all other hazardous chemicals used in the work area
- Notifying EHS when there is a change in equipment, processes, or controls which may result in additional exposure to benzene
- Notifying EHS of any employee incidents involving benzene, including but not limited to the filing Notice of Incident (Record Only) or Workers Compensation claims

## 2.4. Employee Occupational Health Services (EOHS) is responsible for:

- Conducting medical surveillance in accordance with 29 CFR 1910.1028(i)
- Maintaining records of physical examinations, x-rays and tests
- Providing written medical opinions to both employee and employer

## 2.5. Employees are responsible for:

- Knowing the provisions of the Benzene Safety Program
- Reporting accidents, possible exposures or unsafe conditions to their supervisor
- Utilizing engineering controls and PPE

## 3. HAZARD DATA

Benzene is a volatile, colorless, sweet-smelling, highly flammable liquid that dissolves easily in water. Benzene is used as a constituent in motor fuels; as a solvent for fats, waxes resins, oils, inks, paints, plastics and rubber; in the extraction of oils from seeds and nuts; in photogravure printing; and in the manufacture of detergents, explosives, pharmaceuticals and dyes. Elevated levels of benzene in ambient air can be attributed to burning fossil fuels, evaporation from gasoline stations and evaporation of industrial solvents.

Benzene is classified as a known carcinogen by the EPA. Benzene may affect the body through inhalation, skin/eye contact or accidental ingestion. Benzene exposure is associated with drowsiness, dizziness, headaches, and eye, skin and respiratory tract irritation. Repeated benzene exposure may increase the incidence of blood disorders such as anemia and leukemia.

### 3.1. Acute Health Effects

- **Inhalation** – Neurological symptoms of inhalation exposure to benzene include drowsiness, dizziness, headaches and unconsciousness. In some cases, inhalation may cause irritability and feelings of euphoria and giddiness. Exposure to benzene vapor may irritate the upper respiratory tract.
- **Skin Contact** – Symptoms of dermal exposure to benzene include irritation, redness and blisters.
- **Eye Contact** – Benzene exposure to the eyes may cause mild to severe irritation.
- **Ingestion** -- Ingestion of benzene may result in vomiting, dizziness, convulsions and/or death.

### 3.2. Chronic Health Effects

Long-term inhalation exposure to benzene at concentrations above 0.03 milligrams per cubic meter may cause disorders of the blood. Benzene specifically affects bone marrow. Aplastic anemia, excessive bleeding and damage to the immune system may develop. Increased incidence of leukemia has been observed in humans occupationally exposed to benzene.



### 3.3. Physical Hazards

Benzene poses a high fire and explosion hazard when exposed to heat or flame. Benzene is classified as a Category 2 flammable liquid by the Global Harmonization System. Class 2 flammable liquids have flash points of less than 0°F and can be ignited under almost all ambient temperature conditions.

Benzene reacts vigorously with allyl chloride and other alkyl halides in the presence of ethyl aluminum dichloride. Explosions have been reported. Benzene ignites in contact with powdered chromic anhydride.

## 4. PERMISSIBLE EXPOSURE LIMITS

OSHA has established the following limits for employee exposures to benzene, with regulatory requirements triggered by each limit.

- **Action Level (AL)** -- The AL is defined as 0.5 parts benzene per million parts of air (0.5 ppm), calculated as an 8-hour time-weighted average. At or above this concentration, OSHA mandates that employers initiate certain required activities such as exposure monitoring and medical surveillance.
- **Permissible Exposure Limit (PEL)** -- The PEL is 1.0 part benzene per million parts of air (1 ppm), calculated as an 8-hour time-weighted average. At concentrations at or above this limit, OSHA requires employers to provide protective equipment such as respirators, to establish administrative controls, to study and install engineering controls (if feasible), to establish regulated areas, and to perform other OSHA-required procedures and duties.
- **Short Term Exposure Limit (STEL)** -- A limit defined as 5 parts benzene per million parts of air (5 ppm), averaged over any one 15-minute period. If the STEL is exceeded, the same mandates as those for exceeding the PEL are triggered.

## 5. EMPLOYEE EXPOSURE ASSESSMENTS

When benzene is used in a work area and no objective data are available demonstrating that exposures are not above the Action Level, EHS will conduct air monitoring 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 greater than the AL but less than the PEL, EHS will repeat air monitoring once per year.
- If employee exposures are found to be greater than the PEL, EHS will conduct air monitoring every six months.
- If exposures are above the STEL, work must be stopped until the exposure level is reduced by implementing engineering and/or administrative controls. EHS will conduct air monitoring after the new controls are in place.

Air monitoring will be conducted promptly in a work area if employees are experiencing signs or symptoms of benzene exposure. The affected employee(s) should report to Employee Occupational Health Services (EOHS) for evaluation.

Air monitoring must be repeated in an area each time there is a change in equipment, processes or controls that may result in additional or reduced exposure to benzene.

To schedule an exposure assessment, call EHS at 505-277-2753. You can also submit an online request via the Quick Links at the bottom of the EHS website home page: [EHS.unm.edu](http://EHS.unm.edu)

## 6. REDUCING EMPLOYEE EXPOSURE TO BENZENE

EHS uses the hierarchy of controls to reduce exposures to hazardous chemicals and processes. The hierarchy of controls methods are listed below in the order in which they should be implemented to reduce exposure. PPE is used as a last resort, in an emergency, or as an extra layer of protection. PPE alone is not sufficient protection for employees.

### 6.1. Substitution

Substitution of a less hazardous chemical or process will be used to reduce or eliminate benzene use and exposures. Suitable benzene substitutes include pentane, cyclopentane, 1,4-dioxane, chloroform and diethyl ether.

### 6.2. Engineering Controls

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, preventing the accumulation of high exposures in the employee's breathing zone. Benzene should only be used in a chemical fume hood or with local exhaust ventilation.

### 6.3. 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 such as by rotating personnel between various job duties.

### 6.4. Personal Protective Equipment (PPE)

Prevent direct contact with the eyes or skin with benzene by the use of protective garments and equipment that are resistant to benzene. The type of PPE necessary will vary depending on the concentration, the amount used, and the potential for splashing. PPE may include goggles, face shield, gloves gowns, lab coats, aprons and arm sleeves. EHS can provide your area with guidance on the appropriate PPE for your area.

All PPE must be inspected by employees prior to each use. PPE must be stored in a clean and sanitary manner, away from direct sunlight. Respirators should be inspected by supervisors each month to ensure they are being used, stored and cleaned properly.

- **Respirators:** If employee exposures are found to exceed the PEL or STEL, work will be stopped. Supervisors will provide respirators until feasible engineering or administrative controls can be implemented, if necessary. EHS, based on air monitoring results, will determine respirator use and type. If respirator use is necessary, employees must be medically cleared by Employee Occupational Health Services (EOHS) and fit-tested and trained by EHS before using a respirator.

In areas where the benzene concentration is unknown or greater than 500 ppm, full body protective clothing and Self-Contained Breathing Apparatus (SCBA) are required. This concentration may be encountered during a large quantity spill of benzene in a confined or small, enclosed area. **Currently, no UNM personnel are trained to handle this type of situation. Evacuate the area and call Campus Police (911 landline or 505-277-2241 on mobile phone).**

## 6.5. Hygiene

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

If employees are required to change from work clothing into protective clothing, change rooms will be provided. Protective clothing contaminated with benzene must not be taken home by employees. Reusable protective clothing must be laundered by the University or a company that is trained to recognize the hazards of benzene.

## 6.6. Emergency Eyewash and Shower

If there is a possibility that employees' skin may be splashed with benzene, an emergency shower will be provided in the work area. If there is a possibility that employees' eyes may be splashed with benzene, a plumbed eyewash station will 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 with benzene, the employee must flush them immediately and continue flushing for at least 15 minutes. The employee should then seek immediate medical attention.

# 7. SIGNAGE AND LABELING

## 7.1. Regulated Areas

Areas where the airborne levels of benzene are found to exceed the PEL and/or the STEL will be regulated areas. Access to these areas will be limited to persons trained on the hazards of benzene. All entrances and access ways will be posted with signs bearing the following information:

**DANGER!**  
**BENZENE**  
**MAY CAUSE CANCER**  
**HIGHLY FLAMMABLE LIQUID AND VAPOR**  
**AUTHORIZED PERSONNEL ONLY**

## 7.2. Container Labels

OSHA Hazard Communication regulations require that all containers must be labeled with the name of the product and the most significant hazards(s) associated with the contents. When a chemical product containing benzene is transferred into a container other than the original, it must be labeled with the following information (at minimum):

**DANGER**  
**BENZENE**  
**MAY CAUSE CANCER**  
**HIGHLY FLAMMABLE LIQUID AND VAPOR**

Pictograms may also be used for labeling. Pictograms for benzene include the following:



## 8. STANDARD OPERATING PROCEDURES

Work with benzene requires a written Standard Operating Procedure (SOP) that addresses the following:

- Hazards of benzene
- Engineering control devices (i.e. chemical fume hood) that will be used
- PPE requirements
- Designated storage and use areas
- Waste disposal information
- Decontamination and spill clean-up procedures

SOP templates are available from EHS.

## 9. EMPLOYEE INFORMATION AND TRAINING

Supervisors are responsible for ensuring that employees with potential exposure to benzene receive the appropriate training before working with it. All training must be documented by the individual presenting the training session or through Learning Central. A training module will be provided to supervisors with employees who work with benzene. Supervisors should review this information with employees annually. It will cover the following:

- Requirements of the OSHA Benzene Standard
- Explanation of UNM's Benzene Safety Program
- Contents of the Safety Data Sheet for benzene
- 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 required PPE
- Instructions for handling spills and emergency procedures

This training must be conducted whenever a new hazard is introduced into the work area, when there is a change in procedure, and whenever the employee demonstrates behavior that indicates a lack of understanding of the basic rules for the safe handling of benzene.

## 10. MEDICAL SURVEILLANCE

Medical evaluation and surveillance as described in the OSHA Benzene Standard [29 CFR 1910.1028(i)] is available through Employee Occupational Health Services (EOHS) to all employees exposed to benzene at or above the STEL or AL. In addition, medical surveillance will be made available to employees who develop signs and symptoms of exposure to benzene and for all employees exposed to benzene in emergencies. The results of medical surveillance and personal exposure monitoring are automatically provided to EOHS by Safety and Risk Services for inclusion in the employee's medical record.

UNM employees may obtain free medical consultation regarding concerns about benzene exposures by contacting EOHS at 505-272-8043. Students with concerns about benzene or other exposures should contact Student Health and Counseling Services at 505-277-3136.

**Medical Removal** -- The University will abide by the medical removal provisions of the OSHA Benzene Standard that outline when an employee should be medically removed due to occupational exposure or other medical conditions identified during periodic medical surveillance. In the event a medical removal is required, EHS will work with management to coordinate an employee's medical removal and reassignment to a comparable job for which the employee is qualified (or can be trained for in a short amount of time). The employee may not suffer a reduction in wage rate, seniority, or other benefits because of the reassignment.

## 11. SPILLS

A spill kit must be kept in areas where benzene and other flammable liquids are used and/or stored. Minor, incidental spills can be cleaned up by lab personnel. Large spills must be cleaned up by appropriately-trained emergency responders.

- Minor spills (one liter or less) – Minor spills in well-ventilated areas can be cleaned up by lab personnel using materials in the spill kit. Minimum PPE required to clean up a benzene spill are a lab coat, safety glasses/goggles and gloves. If there is any concern for inhalation exposures, respiratory protection is required. The spill clean-up materials must be double-bagged, tightly closed, labeled and picked up by EHS for disposal.
- Major spills (more than one liter) – Lab personnel should not attempt to clean up major spills of benzene or spills in confined areas where ventilation is poor. In the event of a major spill, evacuate the area and call Campus Police (911 on a landline or 505-277-2241 on a mobile phone and the EHS duty officer pager 505-951-0194).

## 12. STORAGE

Benzene should be stored in a flammables cabinet when not in use. Keep container tightly closed and kept upright.

Benzene should not be stored with strong oxidizers, strong alkalis/bases or cyanogen halides.

### 13. DISPOSAL

All chemical waste must be disposed of according to federal and state regulations and UNM's Chemical Hygiene Plan. Benzene and benzene-containing wastes should be placed in a labeled waste container in a flammables storage cabinet. Call EHS at 277-2753 to schedule a pickup of waste benzene and/or other waste chemicals.

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# Benzene Safety Program r.2 - 02-15-21

Final Audit Report

2021-02-16

Created:	2021-02-16
By:	Zachary Peterson (zqtpeterson@gmail.com)
Status:	Signed
Transaction ID:	CBJCHBCAABAAfnyM4YYW7LbPUuYDAVg227SbuZdK4tQi

## "Benzene Safety Program r.2 - 02-15-21" History

-  Document created by Zachary Peterson (zqtpeterson@gmail.com)  
2021-02-16 - 10:02:42 PM GMT - IP address: 174.28.5.181
-  Document emailed to Casey B Hall (cbhall4@unm.edu) for signature  
2021-02-16 - 10:03:38 PM GMT
-  Email viewed by Casey B Hall (cbhall4@unm.edu)  
2021-02-16 - 10:23:04 PM GMT - IP address: 174.62.4.62
-  Document e-signed by Casey B Hall (cbhall4@unm.edu)  
Signature Date: 2021-02-16 - 10:24:58 PM GMT - Time Source: server- IP address: 174.62.4.62
-  Document emailed to Zachary Peterson (zpeterson@unm.edu) for signature  
2021-02-16 - 10:25:00 PM GMT
-  Email viewed by Zachary Peterson (zpeterson@unm.edu)  
2021-02-16 - 10:25:43 PM GMT - IP address: 174.28.5.181
-  Document e-signed by Zachary Peterson (zpeterson@unm.edu)  
Signature Date: 2021-02-16 - 10:26:41 PM GMT - Time Source: server- IP address: 174.28.5.181
-  Agreement completed.  
2021-02-16 - 10:26:41 PM GMT