ACU Beryllium Safety Manual

Initial: December – 2024 Revised: June - 2025

PURPOSE

Abilene Christian University (ACU) is committed to providing and maintaining a safe and healthy environment. The health and safety of its employees, students, faculty, visitors, and our community is of the utmost importance.

The Beryllium Safety Manual has been developed to provide direction to ACU faculty, staff, students, tenants, vendors, and contractors who operate in areas where beryllium is present or may be exposed to beryllium to prevent exposure to beryllium and its compounds, mitigate health risks, and ensure compliance with OSHA regulations.

Beryllium is a lightweight metal widely used in advanced technologies due to its unique properties. However, its toxicity poses serious health risks, including Chronic Beryllium Disease (CBD) and lung cancer. This manual is designed to provide comprehensive guidelines for the safe handling, storage, and use of beryllium at the university to protect employees, students, and contractors.

The purpose of this document is to prevent exposure to beryllium and its compounds, mitigate health risks, and assure compliance with OSHA regulations. The Beryllium Safety Manual aims to detect health effects, support workplace interventions, and protect ACU personnel from adverse health effects, playing a critical role in safeguarding the well-being of the ACU community.

POLICY

This manual covers:

1. Laboratories where beryllium is used in research.
2. Workshops handling beryllium-containing materials.
3. Areas designated for beryllium storage or disposal.

All staff, faculty, and contractors whose work is under the supervision of ACU shall comply with this program manual. Failure to comply with this program or the laws and regulations referenced within this program may result in disciplinary action up to and including termination. Any deviations from this Beryllium Safety Manual must be reported to the Office of Institutional Compliance & Risk Management at risk@acu.edu or 325-674-2424.

References

29 CFR 1910.1024: OSHA Beryllium Standard for General Industry

ACS Guidelines on Safe Handling of Beryllium

DEFINITIONS

Action level - a concentration of airborne beryllium of 0.1 micrograms per cubic meter of air ($\mu g/m^3$) calculated as an 8-hour time-weighted average (TWA).

Airborne exposure - the exposure to airborne beryllium that would occur if the employee were not using a respirator.

Beryllium authorized worker - an individual who is permitted by ACU EHS Manager to work in areas where beryllium is present and who has been trained and authorized to perform tasks that may involve exposure to beryllium.

Beryllium lymphocyte proliferation test (BeLPT) - the measurement of blood lymphocyte proliferation in a laboratory test when lymphocytes are challenged with a soluble beryllium salt.

Beryllium sensitization - a response in the immune system of a specific individual who has been exposed to beryllium. There are no associated physical or clinical symptoms and no illness or disability with beryllium sensitization alone, but the response that occurs through beryllium sensitization can enable the immune system to recognize and react to beryllium. While not every beryllium-sensitized person will develop chronic beryllium disease (CBD), beryllium sensitization is essential for development of CBD.

Beryllium Work Area - any room, lab, or designated workspace where materials containing 0.1% or more beryllium by weight are handled, processed, stored, or used in research or operations. This includes locations where beryllium is present during routine tasks, maintenance, or intermittent procedures such as machining, grinding, heating or sample testing. A Beryllium Work Area may or may not exceed airborne exposure limits and is not automatically a regulated area unless additional criteria are met.

Beryllium Regulated Area - any work area, including temporary or maintenance spaces, where either: (1) Airborne beryllium exposure is, or can reasonably be expected to be, at or above the OSHA action level (0.1 $\mu g/m^3$ as an 8-hour TWA) or the short-term exposure limit (2.0 $\mu g/m^3$ over 15 minutes), or (2) Materials containing 0.1% or more beryllium are processed during operations listed in Appendix A of OSHA standard 29 CFR 1910.1024. These areas must be clearly demarcated, have access restricted, and implement required controls, including medical surveillance and personal protective equipment.

Chronic beryllium disease (CBD) - a chronic granulomatous lung disease caused by inhalation of airborne beryllium by an individual who is beryllium sensitized.

Confirmed positive - the person tested has had two abnormal BeLPT test results, an abnormal and a borderline test result, or three borderline test results, obtained from tests conducted within a three-year period. It also means the result of a more reliable and accurate test indicating a person has been identified as having beryllium sensitization.

Contaminated with beryllium and beryllium-contaminated - contaminated with dust, fumes, mists, or solutions containing beryllium in concentrations greater than or equal to 0.1 percent by weight.

Dermal contact with beryllium means skin exposure to: (1) Soluble beryllium compounds containing beryllium in concentrations greater than or equal to 0.1 percent by weight; (2) Solutions containing beryllium in concentrations greater than or equal to 0.1 percent by weight; or (3) Visible dust, fumes, or mists containing beryllium in concentrations greater than or equal to 0.1 percent by weight. The handling of beryllium materials in non-particulate solid form that are free from visible dust containing beryllium in concentrations greater than or equal to 0.1 percent by weight is not considered dermal contact under the standard.

Emergency - any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment which may or does result in an uncontrolled and unexpected release of beryllium that presents a significant hazard.

High-efficiency particulate air (HEPA) filter - a filter that is at least 99.97 percent efficient in removing particles 0.3 micrometers in diameter.

Physician or other licensed health care professional (PLHCP) - an individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows the individual to independently provide or be delegated the responsibility to provide some or all of the health care services required by paragraph (k) of this standard.

ROLES & RESPONSIBILITIES

Environmental Health and Safety (EHS) Manager

- Develop and maintain the Beryllium Safety Manual
- Conduct or oversee routine beryllium monitoring
- Investigate potential beryllium exposures
- Provide engineering controls evaluations and work practice evaluations
- Assure compliance with OSHA standards
- Keep records of medical evaluations and training
- Ensure compliance with OSHA's Beryllium Standard and DOE/NRC guidance
- Maintain documentation of incidents and safety measures

Beryllium Safety Specialist

- Identify and assess beryllium related hazards, including neutron activation risks
- Monitor air, surfaces, and materials for beryllium contamination
- Implement controls and provide training to mitigate beryllium exposure
- Investigate incidents and take corrective actions as needed
- Suspend unsafe operations and escalate unresolved issues when necessary
- Maintain documentation of environmental monitoring
- Provide environmental monitoring data as appropriate to EHS Manager and management for exposure assessment

Supervisors and Management

- Oversee implementation of safety procedures in their areas
- Ensure staff complete required training
- Notify EHS Manager of any changes in beryllium handling activities
- If appropriate, provide appropriate respiratory protection and other PPE

Employees/Beryllium Workers

- Follow established safety protocols
- Properly use PPE and report hazards or unsafe conditions

Contractors

- Submit documentation of beryllium training to the Environmental Health and Safety Manager and agree to adhere to university protocols

EXPOSURE CONTROL MEASURES

Permissible Exposure Limits (PELs)

- Maintain exposure levels below 0.2 µg/m³ (8-hour TWA) and 2.0 µg/m³ (15-minute STEL)

Engineering Controls

- Install and maintain HEPA-filtered exhaust systems for beryllium work areas

Administrative Controls

- Consider rotating employees to reduce cumulative exposure.
- Limit access to beryllium work areas to authorized personnel only.
- Display clear signage marking regulated areas: "DANGER REGULATED AREA BERYLLIUM MAY CAUSE CANCER CAUSES DAMAGE TO LUNGS AUTHORIZED PERSONNEL ONLY WEAR RESPIRATORY PROTECTION AND PROTECTIVE CLOTHING AND EQUIPMENT IN THIS AREA" and “DO NOT ENTER BERYLLIUM USE IN PROGRESS”

Housekeeping

- Maintain all surfaces in beryllium work areas and regulated areas as free as practicable of beryllium
- Ensure all spills and emergency releases of beryllium are cleaned up promptly
- Ensure that surfaces in beryllium work areas and regulated areas are cleaned by HEPA-filtered vacuuming or other methods that minimize likelihood and level of airborne exposure

Safe Work Practices

- Employees must ensure that cleaning equipment is handled and maintained in a manner that minimizes the likelihood and level of airborne exposure and the re-entrainment of airborne beryllium in the workplace
- Prohibit the use of compressed gas for cleaning beryllium-contaminated surfaces
- Implement decontamination protocols before personnel exit work areas

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Respiratory Protection

- Provide appropriate respiratory protection, such as Power Air Purifying Respirators (PAPR) when airborne concentrations exceed permissible exposure
- Fit-test employees annually, as needed, and maintain adherence to ACU's respiratory protection program

Clothing

- Require use of disposable coveralls to prevent cross-contamination
- Ensure contaminated clothing is removed in designated change areas and stored in sealed containers for disposal

Gloves

- Use of layered nitrile and neoprene gloves for handling beryllium to prevent skin exposure

Eye Protection

- Safety goggles with side shields for all tasks involving beryllium outside of a HEPA filter-controlled work area

BERYLLIUM MEDICAL SURVEILLANCE PROGRAM

Enrollment Criteria for Medical Surveillance

Employees may be enrolled in the Beryllium Medical Surveillance Program when one of more of the following apply:

- The employee is exposed to airborne beryllium at or above 0.1 μg/m³ (8-hour TWA) for 30 or more days per year
- The employee exhibits signs or symptoms of chronic beryllium exposure
- The employee requests a medical evaluation related to beryllium exposure
- The employee works in a beryllium regulated area or performs tasks known to generate airborne exposures

Medical surveillance will be offered by ACU at no cost to employees as required under OSHA's beryllium standard. ACU Employees have a right to decline any part of the medical evaluation. Employees will receive a written medical report within 30 days of the exam.

Preliminary Screening

- Conduct baseline evaluations, coordinated through the Environmental Health and Safety Manager, for all individuals working with beryllium, which will include:
    1. BeLPT blood test
    2. Pulmonary function tests
    3. Chest X-rays
    4. A physical examination with emphasis on skin and the respiratory system
    5. An evaluation of employee's medical and work history

Periodic Surveillance

- Schedule follow-up exams every two years or sooner if accidental exposure occurs
- Provide diagnostic evaluations for employees showing signs of sensitization or CBD

Exit Examination

- A final examination will be offered to the employee upon leaving their status as a beryllium worker
- The employee may sign and opt out of this exit examination if their most recent test has been negative for beryllium sensitization or provide diagnostic evaluations showing no signs of sensitization or CBD

Recordkeeping

- All testing and medical related data must be sent directly to the Environmental Health and Safety Manager
- Detailed medical records, including exposure history and test results will be kept by the Environmental Health and Safety Manager for 30 years after employee leaves as a beryllium worker

EXPOSURE AND SPILL PROCEDURES

Exposure Incidents

- Isolate the exposed individual and provide immediate medical evaluation
- The exposed individual will remove contaminated clothing and thoroughly wash exposed skin with soap and water as outlined in decontamination procedures
- If the exposed individual is unable to self-rescue, follow emergency procedures as outlined in the decontamination procedures
- Follow all emergency decontamination procedures in the event of an emergency
- Report all exposure events to the Environmental Health and Safety Manager for medical surveillance evaluation

Spill Containment

- Restrict access to the area and use HEPA-filtered vacuums for cleanup
- Wet-clean surfaces to minimize dust generation
- Dispose of contaminated waste in designated beryllium waste containers
- Initiate beryllium testing procedures to ensure exposure levels are safe prior to returning to normal operation

TRAINING REQUIREMENTS

Frequency

- Conduct initial training before any work involving beryllium is started and provide annual refresher training for all beryllium workers

Content

- Health risks and symptoms of beryllium exposure
- Proper use of engineering controls and PPE
- Emergency response and exposure and spill procedures
- Reporting requirements to EHS Manager

Assessment

- Require participants to pass a knowledge test demonstrating an understanding of safety measures and the content of the ACU Beryllium Safety Manual

RECORDKEEPING AND REPORTING

Exposure Records

- Document all exposure monitoring results and make any necessary records accessible to affected employees

Training Records

- Keep records of employee training, including dates and topics covered, for a minimum of three years

Incident Reporting

- Notify the Environmental Health & Safety Manager at (325) 674-2424 and risk@acu.edu immediately of any spills, exposure, or equipment failures
- Ensure employees and management understand and comply with medical removal when an employee has a confirmed medical report indicating positive finding of CBD diagnosis or a written medical opinion recommending removal from exposure to beryllium

Physician's Written Statement – Medical Surveillance for Beryllium Exposure

For Use by Abilene Christian University

Beryllium Worker Name:_____

I saw the above-named individual on _____ and I completed the following:

(Must be filled in by Physician or clinic.)

• Completed and reviewed the standardized medical questionnaire. Reviewed work history. Emphasis was placed on the respiratory and dermal systems, in accordance with Appendix A of 29 CFR 1910.1024 (Beryllium Standard).

• If employed, I reviewed the employer-provided description of this employee's duties as they relate to beryllium exposure, including:

- anticipated exposure level,

- personal protective equipment (PPE) required,

- previous medical surveillance or exposure records.

• Conducted a physical examination, focusing on the respiratory system and potential dermal effects.

• Performed a lung function test: forced vital capacity (FVC) and forced expiratory volume in one second (FEV_1), per NIOSH and ATS standards.

• Ordered and reviewed a chest X-ray, if clinically indicated. YES_____ or NO_____.

• Ordered a BeLPT (Beryllium Lymphocyte Proliferation Test) per regulatory guidance. YES_____ or NO_____.

• Informed the employee of the results of the exam.

• Educated the employee about potential health outcomes associated with beryllium exposure, including Chronic Beryllium Disease (CBD) and sensitization.

• Advised the employee on smoking cessation, if applicable, due to compounding respiratory risks.

Medical Determination:

Unless otherwise noted below, I determined no medical conditions that would place the employee at increased risk of material health impairment due to beryllium exposure. I recommend no restrictions concerning respirator use or required PPE.

This medical surveillance was conducted in accordance with 29 CFR 1910.1024 (OSHA Beryllium Standard for General Industry).

Comments or limitations, if any:

_____

_____

Physician's Signature _____

Physician's Printed Name _____

Date _____

Street Address _____

City _____ State _____ Phone _____

Applicant Name _____

Date of Birth _____ Banner ID _____

Street Address _____

City _____ State _____ Phone _____