

OSHA INFOSHEET

Beryllium Safety in the Workplace

This Infosheet provides a broad overview about beryllium in the workplace. OSHA's Fact Sheet, [Health Effects of Exposure to Beryllium](#), provides more detailed information about medical testing and surveillance and supplements the InfoSheet.

How do you know you are working with and are potentially exposed to beryllium?

Beryllium (Be) is a lightweight naturally occurring metal used in industrial processes in many different forms, such as pure metal, metal alloys, oxides, or salts.

Processing beryllium in the workplace may expose workers to beryllium compounds through inhalation, ingestion, or skin contact. Exposure to beryllium occurs through:

- Breathing or ingesting airborne beryllium dust, mist, or in other forms during activities including machining or grinding
- Breathing fumes from heating metal containing beryllium or other beryllium compounds at high temperatures
- Skin contact with beryllium-laden dust settled on surfaces or in liquids containing beryllium

OSHA's data indicate that the highest workplace beryllium exposures are associated with primary beryllium, ceramics, composites, and alloy manufacturing and recycling, or machining and fabrication.

How can beryllium affect you?

Exposure to beryllium below OSHA's current permissible exposure limit (PEL) may cause chronic beryllium disease or lung cancer. Employers that use beryllium in workplace processes must provide information and training about beryllium to exposed workers and should encourage them to share it with their healthcare providers.

Chronic Beryllium Disease (CBD) is an incurable, debilitating and life-threatening disease caused by inhalation of airborne beryllium by individuals sensitized to beryllium. People with CBD have lesions in the lungs and signs and symptoms that may include shortness of breath, an unexplained cough, fatigue, weight loss, fever, and night sweats. However, these signs and symptoms may develop at different rates and severity for different people. Signs and symptoms may not be noticed until years after a worker is exposed to beryllium and then may rapidly worsen. CBD diagnosis is difficult because the signs and symptoms for CBD are similar to other lung diseases, such as pulmonary sarcoidosis.

Manufacturing sector	Process*	End Product / Goal
Be/Alloy Manufacturing and recycling	Be primary Production, Foundry/Smelting Work	Pure beryllium, copper and aluminum alloys, Be composites
Ceramic/Composite Manufacturing	Powder handling/machining	Medical equipment, lasers, semiconductors, wireless communications
Parts Manufacturing	Machining/grinding/welding	Consumer electronics (springs and connectors); heat shields; atomic energy applications (reactors/nuclear weapons); Electronic applications (transistors, heat sinks, x-ray windows)
Dental Appliance Fabrication	Machining/Grinding	Crowns, bridges, dental plates
Paint Removal (Construction/Maritime)	Abrasive blasting (containing slags)	Removal of paint from bridges, boats

*Worker exposures to beryllium are caused by processing or handling raw materials containing beryllium, not by using or handling finished products containing beryllium.

Beryllium sensitization is the activation of the body's immune response to beryllium. Sensitization can result from inhalation or skin exposure to beryllium. An individual must become sensitized to beryllium before he or she can develop CBD. Sensitization alone rarely results in noticeable symptoms. A medical screening and surveillance program is critical for detecting the health effects of beryllium exposure. Diagnosing sensitization before CBD develops will provide the opportunity to take measures that may prevent CBD. For more information see OSHA's Fact Sheet, [Health Effects of Exposure to Beryllium](#).

Inhaling beryllium as a dust, fume, or mist, or other form can also cause **lung cancer**. Beryllium is listed by the International Agency for Research on Cancer (IARC) as a group 1 carcinogen to humans, the National Toxicology Program (NTP) as a known human carcinogen, and the American Conference of Governmental Industrial Hygienists (ACGIH®) as a confirmed human carcinogen.

How much is too much?

Employers must comply with the OSHA PEL for beryllium, an 8-hour time weighted average of 2 µg/m³ (29 CFR 1910.1000 Table Z-2). However, OSHA recommends that employers use appropriate measures to reduce worker beryllium exposures to the lowest level feasible, with an emphasis on elimination or substitution. OSHA published a Notice of Proposed Rulemaking for beryllium in the *Federal Register* that proposes to reduce the PEL to 0.2 µg/m³ for general industry. Reported exposures well below the current PEL have resulted in cases of beryllium sensitization and CBD.¹ The American Conference of Governmental Industrial Hygienists (ACGIH®) current Threshold Limit Value (TLV®) for beryllium is 0.05 µg /m³ averaged over an 8-hour work shift.

How to Reduce Beryllium Exposure

While employers must implement feasible engineering and administrative controls and/or use personal protective equipment to comply with the PEL (29 CFR 1910.1000(e)), employers should also take the following measures to further eliminate or reduce beryllium exposure to the lowest possible level in the workplace to prevent beryllium-related disease, and provide medical surveillance to detect beryllium sensitization and CBD.

¹ Rosenman K, Hertzberg V, Rice C, Reilly MJ, Aronchick J, Parker JE, et al. 2005. Chronic beryllium disease and sensitization at a beryllium processing facility. *Environ Health Perspective* 113:1366-1372.

Key Points:

- Beryllium exposure may cause chronic beryllium disease (CBD), an incurable lung disease, and lung cancer.
- OSHA recommends that employers reduce beryllium exposure levels to the lowest level feasible.
- OSHA's Fact Sheet, [Health Effects of Exposure to Beryllium](#), provides more detailed information about medical screening and surveillance.

Recommended ways to reduce exposure to beryllium where exposures are at or below the PEL:

- **Elimination or Substitution** — When possible, employers should eliminate or choose a less toxic alternative to beryllium in order to prevent or reduce exposure. If there are no suitable alternatives which could eliminate beryllium completely, then employers should consider materials that contain lower amounts of beryllium. OSHA's website on Transitioning to Safer Chemicals at www.osha.gov/dsg/safer_chemicals provides more information on substitution options.
- **Engineering Controls** — Employers should implement feasible controls to separate the worker from the beryllium exposure source (e.g., enclosing any beryllium processes, isolating the worker from the beryllium) and/or install ventilation to remove contaminated air.
- **Administrative/Work Practice Controls** — Employers should implement feasible administrative and work practice controls for workplaces with beryllium exposure risk including:

Housekeeping — Implementing housekeeping procedures that safely and effectively reduce beryllium exposures.

- Keep surfaces as clean as possible
- Use high efficiency particulate air (HEPA) vacuums for cleaning
- Use wet cleaning methods to prevent beryllium dust from re-entering the air
- Use only the minimum length of hose needed to prevent dust from accumulating inside the hose

- Ensure that local exhaust systems are not disconnected or disabled during work activities
- Do not use compressed air to clean parts, clothing, or work surfaces

Isolating Contaminated Areas from Break Areas — Employers should encourage exposed workers to wash their face, hands, and forearms with soap and water prior to taking breaks and prohibit them from eating, drinking, smoking, or applying cosmetics in potentially contaminated areas to reduce the potential for exposure.

Safe Handling of Work Clothes — Employers should ensure that beryllium is kept at the workplace and does not contaminate a worker’s car or home.

- Keep clean, pre-work change areas separated from dirty, post-work change areas to prevent cross-contamination
- Notify the laundering facility that clothes are contaminated with beryllium
- Instruct exposed workers to:
 - Keep work clothes as clean as possible during the work shift
 - Wet wipe shoes before leaving the work area
 - Keep work clothes (including work shoes) from being worn outside the facility
 - Place dirty work clothing in a labeled bin with a cover as needed
 - Shower and change into clean clothes prior to leaving the facility

- **Personal Protective Equipment (PPE)** — PPE can be used to protect employees from exposure to beryllium dusts, fumes, mists, and liquids. Even where exposures are at or below the PEL, employers should consider elimination/substitution, and engineering, administrative, and work practice controls to reduce beryllium exposure to the extent feasible before selecting PPE as a method for protecting employees. Regardless of the level of airborne exposure, **PPE may be required** under existing OSHA standards other than the current beryllium PEL in 29 CFR 1910.1000.

Skin Protection — Skin contact with beryllium can cause beryllium sensitization and skin irritation (described above). Employers **must** provide workers with adequate PPE to prevent contact with beryllium-containing dusts, fumes or solutions (29 CFR 1910.132, 29 CFR 1926.28,

29 CFR 1915 Subpart I). Depending on the work activity, appropriate PPE may include gloves, coveralls, waterproof aprons, shoe covers, or coveralls.

Eye Protection — Beryllium can cause eye irritation. Employers **must** provide workers with adequate eye protection to prevent hazardous eye contact with beryllium (29 CFR 1910.133, 29 CFR 1926.102, 29 CFR 1915.153).

Respiratory Protection — Employers **must** provide employees with respirators when necessary to protect their health: respirators are always required where, even if engineering or other controls are in place, exposures exceed an OSHA PEL (29 CFR 1910.134, 29 CFR 1926.103, 29 CFR 1915.154). Even where respirators are not mandated by an OSHA standard, employers may choose to require employees to wear respirators to protect their health. Whenever respirators are required, whether by an OSHA standard, the OSH Act, or by the employer, the employer must have a respiratory protection program that meets the requirements of OSHA’s Respiratory Protection standards (29 CFR 1910.134, 29 CFR 1926.103, 29 CFR 1915.154). This program must include proper respirator selection, fit testing, medical evaluations, and training.

Employers must provide training

The Hazard Communication standard (29 CFR 1910.1200) requires employers to provide workers with training and information about hazardous chemicals used in the workplace. Employers must provide training and information to exposed workers in a manner and language that they understand. Employers must prepare and implement a written hazard communication program, provide training and information on the hazards of beryllium and other hazardous chemicals used in the workplace, and provide exposed workers ready access to Safety Data Sheets (SDSs) on beryllium and other hazardous chemicals to which they are exposed at work.

Additional OSHA Resources

Beryllium Safety and Health Topics Page
www.osha.gov/SLTC/beryllium

A Collection of Brochures on Beryllium
www.osha.gov/SLTC/beryllium/brochures.html

Preventing Adverse Health Effects from Exposure to Beryllium in Dental Laboratories
www.osha.gov/dts/hib/hib_data/hib20020419.html

Workers' Rights

Workers have the right to:

- Working conditions that do not pose a risk of serious harm.
- Receive information and training (in a language and vocabulary the worker understands) about workplace hazards, methods to prevent them, and the OSHA standards that apply to their workplace.
- Review records of work-related injuries and illnesses.
- File a complaint asking OSHA to inspect their workplace if they believe there is a serious hazard or that their employer is not following OSHA's rules. OSHA will keep all identities confidential.

- Exercise their rights under the law without retaliation, including reporting an injury or raising health and safety concerns with their employer or OSHA. If a worker has been retaliated against for using their rights, they must file a complaint with OSHA as soon as possible, but no later than 30 days.

For more information, see [OSHA's Workers page](#).

Contact OSHA

For questions or to get information or advice, to report an emergency, fatality, inpatient hospitalization, amputation, or loss of an eye, or to file a confidential complaint, contact your nearest OSHA office, visit www.osha.gov or call OSHA at 1-800-321-OSHA (6742), TTY 1-877-889-5627.

This InfoSheet is not a standard or regulation, and it creates no new legal obligations. It contains recommendations as well as descriptions of mandatory safety and health standards. The recommendations are advisory in nature, informational in content, and are intended to assist employers in providing a safe and healthful workplace. The *Occupational Safety and Health Act* requires employers to comply with safety and health standards and regulations promulgated by OSHA or by a state with an OSHA-approved state plan. In addition, the Act's General Duty Clause, Section 5(a)(1), requires employers to provide their employees with a workplace free from recognized hazards likely to cause death or serious physical harm.



U.S. Department of Labor

