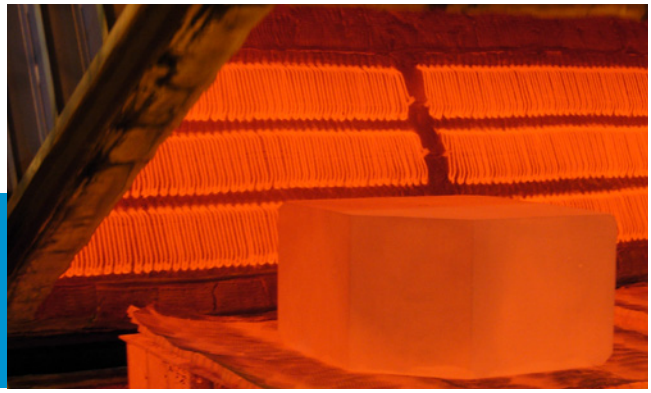
# 4Be Responsible
Beryllium Product Stewardship



## BERYLLIUM-CONTAINING MATERIALS
## HEAT TREATING EXPOSURE CONTROL GUIDE

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## BERYLLIUM (BE) – CONTAINING ALLOYS

Beryllium-containing alloys, in solid form and as contained in finished products present no special health risks.

However, some manufacturing operations are known to generate airborne particulate. Like many industrial processes, Heat Treating of beryllium-containing alloys present a health risk if effective controls are not implemented.

The inhalation of beryllium-containing dust, mist or fume can cause a serious lung condition in some individuals. The degree of hazard varies depending on the form of the product and how the material is processed and handled. You must read the product specific Safety Data Sheet (SDS) for additional environmental, health and safety information before working with any beryllium-containing alloys.

The use of engineering and work practice controls are the preferred methods of controlling exposure to beryllium-containing particulate reliably below the BeST Recommended Exposure Guideline (REG) of 0.6 microgram of beryllium per cubic meter of air ($\mu g/m^3$) (Inhalable), measured as an 8-hour time weighted average (TWA) or the occupational exposure limit (OEL) applicable to the Member State for airborne beryllium.

## HEAT TREATMENT

Heat treatment of beryllium containing alloy parts requires certain safety precautions in most instances. Before heat treating, the parts should be cleaned to remove machining lubricant, which, if not removed, can cause staining when exposed to elevated temperatures.

While beryllium-containing alloy heat treating operations do not generate any beryllium-containing fume, spalling of the surface oxide during subsequent material handling steps can cause exposures which must be controlled.

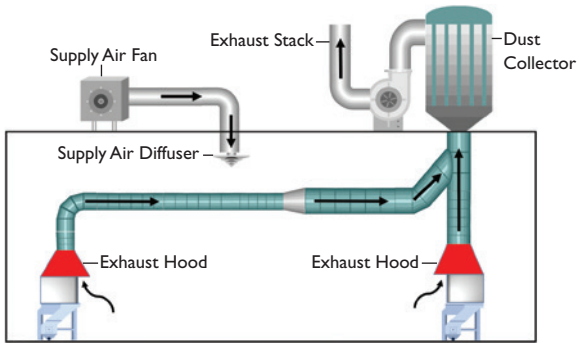
High temperature annealing operations in air can produce a visible oxide scale that is easily dislodged from the surface. This scale can contain beryllium oxide in higher proportion than that found in the base metal. It is best if the furnace atmosphere is controlled to minimize oxide formation. An inert or reducing furnace atmosphere in the lower temperature precipitation aging step produces a thin, transparent, adherent oxide that usually presents no handling problems.

The oxidized surface of heat-treated beryllium-containing alloy parts should be cleaned before further processing, particularly if they will be plated, soldered, brazed or welded. Chemical cleaning in an acid solution is preferred to minimize the potential for exposure to fine particulate. Mechanical surface conditioning, such as grinding or grit blasting, must be done in a manner to prevent or control the release of airborne particulate. Keeping the oxide moist can control generation of airborne particulate during handling and disposal; however, ventilation is the preferred method to control airborne generation of particulate.

## EXHAUST VENTILATION

Local exhaust ventilation (LEV) is the preferred control technology. Where utilized, exhaust inlets to the ventilation system are generally positioned as close as possible to and in-line with the source of generated airborne particulate. The type and capacity of the LEV will depend on the speed of the particle generation.

As part of the ventilation equipment, process exhaust air should be directed through a High Efficiency Particulate Air (HEPA) filtering device to the outdoors where it will not be recirculated back to the work area.




Ventilation equipment must be inspected regularly to ensure it is functioning properly. Provide training on the use, operation and maintenance of ventilation systems to all users.

## PERSONAL PROTECTIVE EQUIPMENT (PPE)


When engineering and/or work practice controls are not practical or effective, personal protective equipment (PPE) must be used to prevent skin contact and inhalation of beryllium-containing particulate. Instruct operators to wear gloves when handling parts that are not visibly clean.

Ensure that work clothing, e.g. pants and shirts, are maintained in a visibly clean condition when there is potential for contact with beryllium-containing particulate or solutions.

When airborne exposures exceed or have the potential to exceed REG or OEL, approved respirators must be used as specified by an industrial hygienist or other qualified professional.

## MAINTENANCE

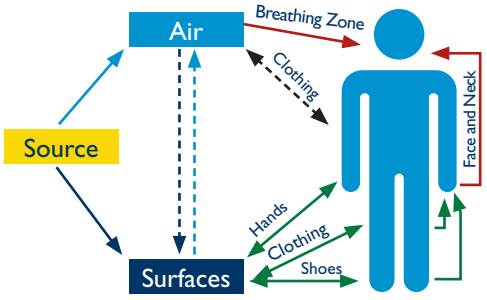
Under certain conditions the repair or maintenance of equipment including furnace rebuilding activities can generate airborne particles. Protecting workers can require the use of specific work practices or procedures involving the combined use of ventilation, wet and vacuum cleaning methods, respiratory protection, decontamination, special protective clothing and when necessary, restricted work zones. Detailed procedures for safely maintaining the process equipment and ventilation systems should be developed. All operators and maintenance personnel need to be trained in the established procedures prior to performing maintenance or service activities. The procedures should detail the use of wet methods or HEPA vacuuming, ventilation and appropriate PPE to prevent exposures to airborne particles.

## HOUSEKEEPING


Good work practices and the implementation of procedures for keeping the heat treating work area and floors clean and free of beryllium-containing particulate accumulations are important methods for maintaining exposures reliably below the REG or applicable OEL. The use of compressed air or brooms for cleaning should be prohibited. Wet cleaning and HEPA vacuuming are effective methods for cleaning. Disposable rags, towels or wipes should be used to wet clean, not be allowed to dry out and must be kept in a closed container. Rags and towels should not be reused.

## WORKPLACE EXPOSURE CHARACTERIZATION

In accordance with good industrial hygiene practice, a characterization of worker exposure, including air monitoring, should be conducted for operations where a potential for beryllium exposure exists.




## RECYCLING / DISPOSAL

Beryllium-containing scrap is a valuable material and should be recycled whenever possible. Beryllium-containing scrap should be kept segregated from other metals to retain its higher value as a recyclable material.

If not recyclable, materials containing beryllium are considered waste and must be disposed in accordance with applicable EU and Member State regulations. Beryllium-containing wastes should be maintained in a moist condition during collection, storage and disposal, double bagged in plastic andsealed in an appropriate container to minimize the potential for release and exposure.

## ADDITIONAL INFORMATION

Additional worker protection guidance can be obtained online at www.beryllium.eu or by contacting the **Beryllium Science & Technology Association (BeST)** at: Avenue Marnix 30, 1000 Brussels, **Tel:** +32 (0)2 213 74 20 | **Email:** info@beryllium.eu