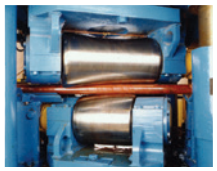
4Be Responsible

Beryllium Product Stewardship

BERYLLIUM-CONTAINING MATERIALS
HEALTH & SAFETY GUIDE



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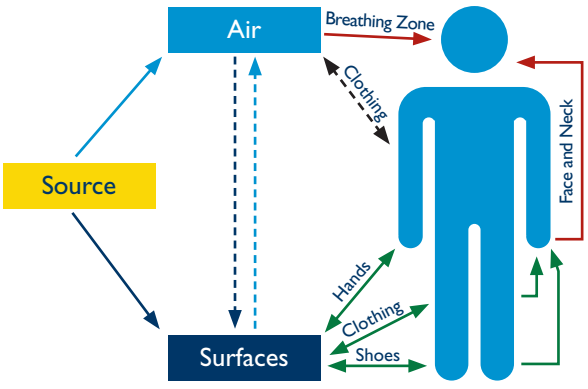
BERYLLIUM (BE) – CONTAINING ALLOYS

Beryllium-containing alloys, in solid form and as contained in finished products, present no special health risks. However, like many industrial materials, beryllium-containing alloys present a health risk if handled improperly. 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.

BERYLLIUM WORKER PROTECTION MODEL

The Beryllium Worker Protection Model is the focus of Be Responsible and is based on eight elements that have been developed from research to practice experiences.



Keeping beryllium out of the lungs is of utmost importance, however, the contribution of each of the other model elements toward disease prevention cannot be overlooked. The implementation of all elements contributes to and reinforces success in the others. The collective nature of exposure controls in all elements drives the success of this model.

It is understood that this model is not a one size fits all approach and that end users may need all or only part of this model in their workplace.

The success of this model supports the hypothesis that worker protection can be achieved by a combination of management commitment, a disciplined use of the Beryllium Worker Protection Model and active worker engagement.

The eight elements are defined by having procedures in place and work practices observed as described by the following:

1) Keep Beryllium Out of the Lungs

Where engineering and work practice controls cannot reduce exposures to below the BeST Recommended Exposure Guideline (REG) of 0.6 microgram of beryllium per cubic meter of air (µg/m3) (Inhalable) or the occupational exposure limit (OEL) applicable to the Member State, respiratory protection must be worn. This level is not visible to the eye and must be measured by sampling the air.

2) Keep Beryllium Off of the Skin

Prevent skin contact with beryllium-containing solutions, compounds, or particulate. Wash hands, face, hair and skin if dirty.

3) Keep Beryllium Off of the Clothes

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. Do not wear personal clothing in beryllium work areas without protective over-garments.

4) Keep Beryllium at the Source

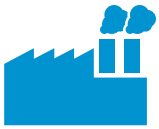
Work processes should be evaluated for the routes by which beryllium-containing particulate or solutions may escape manufacturing processes (e. g. on people, product or equipment). Use engineering controls (local exhaust ventilation) and work practice controls (example: use of wet methods) to minimize the generation of beryllium-containing particulate from becoming airborne. of beryllium-containing particulate from becoming airborne.

5) Keep Beryllium in the Work Area

Control the unintended transport of beryllium-containing solutions or particulate to other work areas, and eliminate the spread of beryllium to non-beryllium work areas on the site.

6) Keep Beryllium on the Plant Site

Prevent beryllium-containing particulate from leaving the plant site in an uncontrolled fashion i.e. on skin, hair, clothes, shoes, tools, equipment etc. .



7) Keep Beryllium Work Areas Clean

Ensure that work areas and surfaces are orderly, well-lit, uncluttered and visibly clean (Free of dust or dirt). Clean surfaces with HEPA vacuums or use wet methods. Do not use compressed air or brooms.

8) Keep Beryllium Workers Prepared

Workers must be educated, trained, motivated, engaged and equipped to meet the above guidance from the first day of work with beryllium-containing alloys

SOURCES OF EXPOSURE

All operations performed on beryllium-containing alloys must be performed with appropriate work practices and engineering controls designed to control the release or generation of airborne beryllium-containing dust, mist or fume. The following tables provide a summary of those processes that typically present low inhalation concern (green) and those that present a likely inhalation hazard (yellow)

Low Inhalation Concern Operations

- Adhesive Bonding
- Age Hardening (<950°F)
- Assembly
- Bending
- Blanking
- Bonding
- Boring
- Broaching
- CNC Machining
- Cold Forging
- Cold Heading
- Cold Pilger
- Cold Rolling
- Cutting
- Deburring (non-grinding)
- Deep Hole Drilling
- Drawing
- Drilling
- Dry Tumbling
- Electroless Plating
- Electroplating
- Extrusion
- Filing by Hand
- Gun Drilling
- Hand Solvent Cleaning
- Handling
- Heading
- Heat Treating (inert atmosphere)
- Inspection
- Machining
- Metallography
- Milling
- Packaging
- Painting
- Physical Testing
- Piercing
- Pilger
- Plating
- Pressing
- Radiography/X-ray
- Reaming
- Ring Forging
- Ring Rolling
- Roll Bonding
- Rotary forging
- Sawing (tooth blade)
- Shearing
- Shipping
- Sizing
- Skiving
- Slitting
- Stamping
- Straightening
- Stretch Bend Leveling
- Stretcher Leveling
- Tapping
- Tensile Testing
- Thread Rolling
- Trepanning
- Tumbling
- Turning
- Ultrasonic Cleaning
- Ultrasonic Testing
- Upsetting

Likely Inhalation Hazard Operations

- Abrasive Blasting
- Abrasive Processing
- Abrasive Sawing
- Annealing
- Brazing
- Bright Cleaning
- Brushing
- Buffing
- Burnishing
- Casting
- Centerless Grinding
- Chemical Cleaning
- Chemical Etching
- Chemical Milling
- Coolant Management
- Deburring (grinding)
- Destructive Testing
- Dross Handling
- Electrical Chemical Machining (ECM)
- Electrical Discharge Machining (EDM)
- Electron Beam Welding (EBW)
- Forging
- Grinding
- Heat Treating (in air)
- High Speed Machining (>10,000 rpm)
- Honing
- Hot Forging
- Hot Rolling
- Investment Casting
- Lapping
- Laser Cutting
- Laser Machining
- Laser Scribing
- Laser Marking
- Laser Welding
- Laundering
- Melting
- Photo-Etching
- Pickling
- Point and Chamfer
- Polishing
- Process Ventilation Maintenance
- Resistance Welding
- Roller Burnishing
- Sand Blasting
- Sand Casting
- Sanding
- Scrap Management (Clean)
- Sectioning
- Slab Milling
- Soldering
- Solution Management
- Spot Welding
- Sputtering
- Swaging
- Torch cutting (i.e., oxy-acetylene)
- Water-jet Cutting
- Welding (ARC, TIG, MIG, etc.)
- Wire Electrical Discharge Machining (WEDM)

USES ADVISED AGAINST

Uses by Professional Workers for:

> Casting Dental Alloys > Casting alloys outside industrial installations > Casting by artist of jewelry

Uses by individual consumers

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