MATERIAL SAFETY DATA SHEET

No. J79-198 Rev. 0
Dated 10/10/2013

Section 1. COMPANY AND PRODUCT IDENTIFICATION

Manufacturer's Name: AMPCO METAL
E-Mail: info@ampcometal.com
Website: www.ampcometal.com

Material Name: Copper Base Alloy, Rods, Bars, Tubes, Shapes, Flat Products and Scrap Materials containing Beryllium.

Section 2. COMPOSITION / INFORMATION ON COMPONENTS

Individual AMPCO Alloy compositions are shown on the Certification of Chemical and Mechanical Properties, when supplied, or may be found in AMPCO promotional literature, such as bulletins: G-51, G-100, G-120, etc.

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS Number</th>
<th>Percent</th>
<th>OSHA PEL 8-Hr TWA</th>
<th>ACGIH-TLV 8-Hr TWA</th>
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<tr>
<td>Aluminum**</td>
<td>7429-90-5</td>
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<tr>
<td>Metal</td>
<td></td>
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<tr>
<td></td>
<td>Dust</td>
<td>15</td>
<td>10</td>
<td></td>
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<tr>
<td></td>
<td>Fume</td>
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<td>5</td>
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<tr>
<td>Beryllium*</td>
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<td>0.25-2</td>
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<td>Inhalable particulate matter</td>
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<td>0.00005</td>
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<td></td>
<td>Dust</td>
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</tbody>
</table>

Elements having a listed percentage greater than zero will be present in all alloy grades. Elements having percentages starting with zero may not be present in certain alloy grades.

* This constituent, a toxic chemical, makes this product subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372. Quantity threshold for this chemical, below which reporting of releases is not required, is 25,000 pounds.

** This constituent is reportable only if in the form of dust or fume.
Note: **Beryllium** and **Nickel** have been identified as potential human carcinogens. This material is classified as not hazardous under OSHA regulations

**Section 3. Hazards Identification**

**Emergency Overview**

If the material is involved in a fire, pressure-demand self-contained breathing apparatus and protective clothing must be worn by persons potentially exposed to the metal fumes or airborne particulate.

**Primary routes of exposure**

**Inhalation**: Airborne exposure to the elemental constituents listed in Section 2 in excess of the occupational standards can occur when melting, casting, dross handling, pickling, abrasive cutting, welding, grinding, sanding, polishing, milling, crushing, or otherwise abrading the surface of this material in a manner which generates finely divided particles. Typical lathe machining, drilling, slitting, brazing, soldering or cold stamping of this material normally does not produce airborne concentrations in excess of the occupational standards. Cast or heat treated products which have surface scale or oxidation should have the scale, containing beryllium oxide, chemically removed from the surface prior to working the surface to prevent potential exposure in excess of the occupational standards.

Grinding or sanding operations conducted under a flood of liquid coolant may require local exhaust ventilation. The cycling through a machine of liquid lubricant/coolant containing finely divided particulate in suspension can result in the concentration building to a point where the particulate may become airborne during use. A filter, centrifuge, or settling chamber can be installed if necessary. The potential for exposures may also occur during repair or maintenance activities on contaminated equipment such as: furnace rebuilding, maintenance or repair of air cleaning equipment, structural renovation, welding, etc.

**Ingestion**: There are no known cases of illness resulting from ingestion of this material. Ingestion can occur from hand, clothing, food, and drink contact with metal dust, fume or powder during hand to mouth activities such as eating, drinking, smoking, nail biting, etc. These products are not intended for internal consumption. As a standard hygiene practice, hands should be washed before eating or smoking.

**Skin**: Skin contact with this material may cause, in some sensitive individuals, an allergic dermal response from copper present in the form of metal dust or powder. Skin abrasion may cause irritation. See Section 4 for additional information. The beryllium in this alloy is in an insoluble form and does not pose a potential for an allergic dermal response.

**Eyes**: Injury can result from particulate irritation or mechanical injury to the eyes by dust or particulate. Exposure may result from direct contact with airborne particulate (chips, dust or powder) or contact to the eye of contaminated hands or clothing.

**Effects of overexposure**

The potential health effects listed below are confined to constituents which are in sufficient concentrations within the product to be significant.

**Acute** *(immediate or near-term health effects)*: The beryllium fraction of this product is insoluble and does not cause acute beryllium disease. Excessive inhalation of copper can cause respiratory irritation, cough, bronchitis, chills, "metal fume fever," decreased pulmonary function, and asthma-like symptoms. Contact with copper may cause allergic skin reactions. The beryllium in this product does not pose a potential for an allergic skin reaction.

**Chronic** *(long-term health effects)*: Exposure to airborne particulate containing beryllium may cause long-term health effects including loss of lung function, fibrosis, or subsequent secondary effects on the heart with eventual permanent impairment. Inhaling dust or fumes containing beryllium may cause serious, chronic lung disease called Chronic Beryllium Disease (CBD) in some individuals. Over time lung disease can be fatal. Chronic beryllium disease is a
hypersensitivity or allergic condition in which the tissue of the lungs becomes inflamed with a cellular nodular reaction. This inflammation, sometimes with accompanying fibrosis, may restrict the exchange of oxygen between the lungs and the bloodstream. This allergic response to beryllium is limited to susceptible persons. Medical science suggests this susceptibility is related to genetic factors. Exposure to airborne beryllium does not cause a chronic reaction in most people.

Carcinogenic references: The question of whether occupational exposure to beryllium materials cause human cancer has been examined extensively for over 30 years without producing any study which clearly demonstrates an association after taking into account effects of smoking and other workplace carcinogen exposure. However, based on the few existing epidemiological studies and animal experimentation, the International Agency for Research on Cancer and the National Toxicology Program lists beryllium as a carcinogen.

Medical conditions aggravated by exposure: Individuals who may have had allergic reaction or sensitivity to copper may encounter skin rash or dermatitis if skin contact with this product occurs. Persons with impaired pulmonary function, airway diseases, or conditions such as asthma, emphysema, chronic bronchitis, etc. may incur further impairment if dust or fume are inhaled. If prior damage or disease to the neurologic (nervous), circulatory, hematologic (blood), or urinary (kidney) systems has occurred, proper screening or examinations should be conducted on individuals who may be exposed to further risk where handling and use of this material may cause exposure.

Section 4. First Aid Measures

Inhalation: Breathing difficulty caused by inhalation of dust or fume requires immediate removal to fresh air. There are no known cases in which a person stopped breathing as a result of exposure. If breathing has stopped, perform artificial respiration and obtain medical help.

Ingestion: Swallowing metal powder or dust can be treated by having the affected person drink large quantities of water and attempting to induce vomiting, if conscious. Obtain medical help.

Skin: Skin cuts and abrasions should be treated by standard first aid. Skin contamination with dust or powder can be removed by washing with soap and water. Obtain medical help if irritation persists. Accidental implantation of this material beneath the skin requires it be removed to prevent infection or development of a corn-like lesion.

Eyes: Dust or powder should be flushed from the eyes with a lot of clean water. Obtain medical help if irritation persists. Contact lenses should not be worn when working with metal dusts and powders because the contact lens must be removed to provide adequate treatment.

Treatment of chronic Beryllium disease: There is no known treatment which will cure chronic beryllium disease. Prednisone or other corticosteroids are the most specific treatment currently available. They are directed at suppressing the immunological reaction and have been effective in diminishing many signs and symptoms of chronic beryllium disease. In cases where steroid therapy has had only partial or minimal effectiveness, other immunosuppressive agents, such as cyclophosphamide, cyclosporine, or methotrexate, have been used. These latter agents remain investigational. Further, in view of the potential side effects of all the immunosuppressive medications, including steroids such as prednisone, they should be used only under the direct care of a physician. In general, these medications should be reserved for cases with significant symptoms and/or significant loss of lung function. Other symptomatic treatment, such as oxygen, inhaled steroids or bronchodilators, may be used by some physicians and are effective in selected cases. The decision about when and with what medication to treat is a judgment situation for individual physicians. For the most part, treatment is reserved for those persons with symptoms and measurable loss of lung function. The value of starting oral steroid treatment, before signs or symptoms are evident, remains a medically unresolved issue currently under study. Some physicians are concerned that their patients may develop a resistance to medication if it is started too soon. The effects of continued low exposure to beryllium are unknown for individuals who are sensitized to beryllium or who have a diagnosis of chronic beryllium disease. This uncertainty leads some physicians to advise a reduction or elimination of further exposure to beryllium. However, some individuals have developed CBD or have gradually become worse after removal from further exposure. Others have continued to work in the beryllium industry without any additional, or
accelerated, loss of lung function.

Section 5. Fire Fighting Measures

Flash Point: Non-combustible as a solid. No ignition as layer of sub 44 micron particles of nominal 98% CuBe.

Explosive Limits: Not applicable to solids. No ignition as cloud of sub 44 micron particles of nominal 98% CuBe.

Extinguishing Media: This material is non-combustible. Use extinguishing media appropriate to the surrounding fire.

Unusual Fire and Explosion Hazards: Do not use water to extinguish fires around operations involving molten metal due to the potential for steam explosions.

Special Fire Fighting Procedures: If this material becomes airborne as a respirable particulate during a fire situation, pressure-demand self-contained breathing apparatus must be worn by firefighters or any other persons potentially exposed to the metal fumes.

Section 6. Accidental Release Measures

Steps to be taken if material is released or spilled: In solid form, this material poses no special health or environmental risk. If this material is in powder or dust form, establish a restricted entry zone based on the severity of the spill. Persons entering the restricted zone must wear adequate respiratory protection and protective clothing appropriate for the severity of the spill. Cleanup should be conducted with a vacuum system utilizing a high efficiency particulate air (HEPA) filtration system followed by wet cleaning methods. Special precautions must be taken when changing filters on HEPA vacuum cleaners used to clean up potentially toxic materials. Caution should be taken to minimize airborne generation of powder or dust and avoid contamination of air and water. Depending upon the quantity of material released, fine powder or dust spills to the environment may require reporting. Vacuum or sweep material and place in a disposal container. Wear protective gloves to avoid cuts from burrs or sharp edges when handling larger pieces for disposal.

Section 7. Handling And Storage

No special precautions are necessary for bulk materials. Store material away from incompatible materials and keep dust or fines away from sources of ignition. Wear gloves when handling parts with sharp edges. Store in a dry area.

Section 8. Exposure Control / Personal Protection

Ventilation and engineering controls: Whenever possible, the use of local exhaust ventilation or other engineering controls is the preferred method of controlling exposure to airborne dust and fume. Where utilized, pickups on flexible ventilation lines should be positioned as close to the source of airborne contamination as possible. Disruption of the airflow in the area of a local exhaust inlet, such as by a man cooling fan, should be avoided. Ventilation equipment should be checked regularly to ensure it is functioning properly. Ventilation training is recommended for all users. Ventilation systems should be designed and installed by qualified professionals.
Respiratory protection: When potential exposures are above the occupational limits shown in Section 2, approved respirators must be used as specified by an Industrial Hygienist or other qualified professional. Respirator users must be medically evaluated to determine if they are physically capable of wearing a respirator. Quantitative and/or qualitative fit testing and respirator training must be satisfactorily completed by all personnel prior to respirator use. Users of any style respirator must be clean shaven on those areas of the face where the respirator seal contacts the face. Exposure to unknown concentrations of fumes or dusts requires the wearing of a pressure-demand airline respirator or pressure-demand self-contained breathing apparatus. Pressure-demand airline respirators are recommended when performing jobs with high potential exposures such as changing filters in a baghouse air cleaning device.

Housekeeping: Vacuum and wet cleaning methods are recommended for dust removal. Be certain to de-energize electrical systems, as necessary, before beginning wet cleaning. Vacuum cleaners with high efficiency particulate air (HEPA) filters are the recommended type. The use of compressed air or brooms to remove dusts must be avoided as such an activity can result in unnecessary short-term elevated exposures to airborne dusts.

Maintenance: During repair or maintenance activities the potential exists for exposures to constituents in excess of the occupational standards. Under these circumstances, 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.

Welding: In accordance with OSHA regulation 29 CFR 1910.252 welding of materials containing beryllium is regulated as follows:
Welding or cutting indoors, outdoors, or in confined spaces involving beryllium containing base or filler metals shall be done using local exhaust ventilation and airline respirators unless atmospheric tests under the most adverse conditions have established that the workers' exposure is within the acceptable concentrations defined by 29 CFR 1910.1000. In all cases, workers in the immediate vicinity of the welding or cutting operations shall be protected as necessary by local exhaust ventilation or airline respirators.

Other protective equipment: No special protective equipment or clothing is required when handling solid forms. Protective clothing such as fire retardant clothing and molten metal splash resistant garments (i.e., coats, hats, hoods, pants, shoes, gloves) should be worn as necessary to protect from accidental molten metal splash. Protective over garments or work clothing must be worn by persons who may become contaminated with dusts or powders during activities such as machining, furnace rebuilding, air cleaning equipment filter changes, maintenance, furnace tending, etc. Contaminated work clothing and over garments should be managed in such a manner so as to prevent secondary exposure to family and persons such as laundry operators and to prevent contamination to personal clothing. Never use compressed air to clean work clothing.

Protective gloves: Wear gloves to prevent metal cuts and skin abrasions during handling.

Eye protection: Wear safety glasses, goggles, face shield, or welder’s helmet when risk of eye injury is present, particularly during melting, casting, machining, grinding, welding, powder handling, etc.

Recommended monitoring procedures

Environmental surveillance: Exposure to airborne materials should be determined by having air samples taken in the employee breathing zone, work area, and department. The frequency and type of air sampling should be as specified by an Industrial Hygienist or other qualified professional. Air sample results should be made available to employees.

Medical surveillance: Persons exposed to airborne concentrations of this material should be included in a periodic medical surveillance program. The program should include examination of the skin and respiratory system. Non-specific findings of skin rash, skin granulomata, or respiratory signs or symptoms may indicate a reaction to this material. A minimum medical surveillance program should include:
1. Skin examination
2. Respiratory history
3. Auscultation of the lungs
4. Spirometry (FVC and FEV1),
5. Periodic chest x-ray. In addition, a specialized, specific, immunological blood test, the be
ryllium blood lymphocyte proliferation test (BLPT), is available [on a limited basis to assist in the diagnosis] to screen beryllium-exposed persons for beryllium reactions. Note: It should be recognized that the BLPT has limited sensitivity for chronic beryllium disease. Individuals who have an abnormal BLPT are normally referred to a lung specialist for additional specific tests to determine if chronic beryllium disease is present.

Section 9. Physical and Chemical Properties

Boiling Point: Not applicable
Radioactivity: Not applicable
Evaporation Rate: Not applicable
Solubility: None
Freezing Point: Not applicable
Sublimes At: Not applicable
Odor: None
Vapor Density (Air = 1): Not applicable
pH: Not applicable
Vapor Pressure (mmHg): Not applicable
Physical State: Solid % Volatiles By Volume: None
Color: Gold Melting Point (°F): 1616
Density (lb/in3): 0.290

Section 10. Stability And Reactivity

General Reactivity: This material is stable.
Incompatibility (materials to avoid): Avoid contact with mineral acids and oxidizing agents which may generate hydrogen gas. Hydrogen gas can be an explosion hazard.

Hazardous Decomposition Products: None under normal conditions of use.

Hazardous Polymerization: Will not occur.

Section 11. Toxicological Information

There is no information on the toxicity of this alloy. Under normal handling and use of the solid form or this material there are few health hazards.

Section 12. Ecological Information

This material is insoluble in water. This material can be recycled

Section 13. Disposal Considerations

Solid waste management: When spent products are declared solid wastes (no longer recyclable), they must be labeled, managed and disposed of, in accordance with federal, state and local requirements.
This material is not classified a hazardous waste under federal law

Byproduct recycling: When recycled (used in a process to recover metals), this material is not classified as hazardous waste under federal law. Dusty or dust-like materials should be sealed inside two plastic bags, placed in a DOT approved container, and appropriately labeled.

Section 14. TRANSPORTATION INFORMATION

There are no U.S. Department of Transportation hazardous material regulations pertaining to this alloy. Hazard Communication regulations of the U.S. Occupational Safety and Health Administration require this product be labeled.
Section 15. Regulatory Information

See Section 2 for identification of alloy components which may be subject to SARA 313 regulation

Section 16. Other Information

Revised to format of ANSI Standard Z400.1-1998. Section 2 revised.

The following hazard ratings are recommended for the alloy grades covered by this Material Safety Data Sheet:

NFPA
Fire - 0
Health - 0
Reactivity - 0
Specific Hazard - none

To the best of our knowledge, the information contained in this Material Safety Data Sheet is accurate. However, neither AMPCO METAL nor any of its representatives assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards which exist.