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Zinc

Hazard Awareness Bulletin
April 2023

Helping to reduce your exposure to Zinc during metal production and fabrication.

What is Zinc?

Zinc is a blue-white metal that has a distinctive luster. Zinc is brittle at room temperature but can be formed and worked within a narrow temperature band of 100° C to 150° C (212° F to 302°F).

Zinc has good corrosion resistance and is used to plate or galvanize steel to prevent corrosion. When zinc is heated to temperatures above 500°C (932° F) in the flame during oxygen cutting or in the arc during welding, zinc oxide particles are released into the air as zinc oxide fume. Zinc oxide is commonly associated with metal fume fever.

The majority of zinc produced is used as metal, mainly as a coating to protect iron and steel from corrosion (galvanized metal), as alloying metal to make bronze and brass, as zinc-based die casting alloy, and as rolled zinc. The remainder is used for zinc compounds mainly used by the rubber, chemical, paint, cosmetic, and agricultural industries.

How can Zinc affect me?

Workplace exposures to zinc have been associated with a range of potential health effects – some can result from short-term acute exposures, others from long-term, repetitive, chronic exposures. Common symptoms can include irritation of the eyes, nose, and throat.

Did you know?

Metal fume fever is a common, acute respiratory and systemic illness experienced by welders - particularly those conducting hot work or welding on galvanized metals, although high exposures to welding mild steel has been reported to cause the illness.

Potential acute health effects associated with metal production or fabrication

- Metal fume fever
- Respiratory tract irritation

Potential health effects associated with other industries or compounds

- Zinc chloride
- Upper and lower respiratory tract irritation

When do workplace exposures occur?

Inhalation

Often the primary route of zinc exposure is through inhaling dust and fumes from the production and working of elemental zinc and alloys. In metal fabrication the welding, grinding, cutting, drilling, and polishing of alloys that contain zinc can result in significant exposure.

What is welding fume?

The majority of welding fume is filler material that is vaporized by the welding arc. The gaseous metal will react with oxygen in the air to form a metal oxide and will solidify to form tiny metal oxide particles, or fume. Some welding fume will originate from the metals being welded. Many filler materials will contain metals that are known to be toxic and that can have detrimental health effects if inhaled. The contents of the filler material and the amount of welding fume generated will vary by welding process.

Hot Work

Other high energy or "hot work" processes, including cutting, grinding, and even polishing metals can create particles of metal and metal oxides that can be inhaled. Workers can be exposed when working with metals which have a plating or surface coating that contains zinc.

Other industrial applications may create dusts, mists, or fumes of zinc. For example, the handling or application of powered or liquid chemicals which contain zinc.

Dermal

The secondary route of exposure is through contact with the skin and eyes, particularly if zinc is in a liquid form that can readily pass through or damage the skin.

Ingestion

Workers can be exposed by the accidental ingestion of zinc, for example workers eating, drinking, smoking, or biting their nails when their hands are contaminated.

Did you know?

Metal workers, and particularly welders, are prone to developing pneumonia infections. There is a clear correlation between welders and increased risk of developing serious or fatal pneumonia infections.

Health and Safety Executive (HSE). Health risks from welding. https://www.hse.gov.uk/welding/health-risks-welding.html

Industries / Applications where workplace exposures may occur

Examples of metal production and fabrication applications, as well as other industries and processes in which individuals may be exposed to zinc and zinc compounds:

Metal production, metal fabrication and related applications

- Galvanization of other metals
- Die-castings and construction products
- Production of alloys with copper, tin, lead and aluminum

Welders are commonly exposed to zinc when welding metals with (zinc) galvanization. The zinc metal is vaporized and oxidizes, creating a welding fume relatively rich in zinc oxide.

Other applications

- Battery manufacturing
- Zinc chloride is used in solder flux, batteries, textiles, wood preservatives and medical products
- Zinc distearate in the plastics and pharmaceutical industries
- Zinc oxide used a pigment in paints, and in the production of rubber compounds

What can I do to help protect my workers?

Use appropriate controls

Employers need to conduct a risk assessment, including a determination of exposure levels compared to exposure limits to understand what control measures may be needed.

If required, controls from the hierarchy of controls should be implemented and their effectiveness measured. For example, local exhaust ventilation (LEV) can be a highly effective engineering control used in welding, grinding, and many other applications.

Get the equipment that you need

In addition to implementing other control measures, Personal Protective Equipment (PPE) such as Respiratory Protective Equipment (RPE) is commonly used to help reduce exposures and risks to workers.

Respiratory Protective Equipment (RPE) – air-purifying respirators

3M has a range of RPE that can help reduce your exposure to dusts, mists, metal fume, as well as gases and vapors commonly encountered in metal production and fabrication. These include disposable particulate respirators, reusable half- and full-facepiece respirators, and heavy-duty battery powered air-purifying respirators combined with a range of robust facepieces, headtops, and helmets.

Respiratory Protective Equipment (RPE) – supplied air respirators

3M also has a wide range of supplied air respirators, suitable for use in some of the most demanding work environments.

Welding shields with respiratory protections

3M also has a wide range of 3M™ Speedglas™ Welding shields that provide eye and face protection from harmful radiation, sparks, and spatter. All of these welding shields can be used with 3M disposable or reusable half-facepiece respirators. Alternatively, 3M has welding shields and helmets that are designed to work with 3M powered or supplied air systems that provide multiple types of protection in one product.

Eye and Face Protective Equipment

Whether it be a 3M™ Speedglas™ welding visor with an auto-darkening filter or a lightweight full face shield, 3M has a full range of PPE to help protect you from the many hazards encountered in welding and metal working.

Other PPE

3M can also provide a wide range of other safety solutions including:

- Head, eye, and face protection
- Disposable and reusable ear plugs and ear muffs
- Protective Communication solutions
- Disposable protective coveralls
- Fall protection
- Confined space solutions

Find your respirator

Use our interactive disposable respirator selector to help you find a respirator that meets your protection needs.

Find your respirator

Use our respirator selection guide to help you find a respirator that meets your protection needs.

Find your respirator

Use our interactive powered & supplied air respirator selector to help you find a respirator that meets your protection needs.

View all 3M PPE Solutions

Training

A key component of an effective PPE program is training for both workers and those responsible for health and safety in the workplace.

For example, workers wearing PPE should be trained in and understand:

- How PPE works, what it does, and its limitations
- Inspection, maintenance, and cleaning of the PPE as well as identifying defective PPE and knowing proper disposal
- Proper fitting and use of the PPE
- The nature of all hazardous substances present and the potential effects upon their health

Stay Informed

When selecting the appropriate protective equipment, local, state, provincial, or national regulations, laws, and guidelines need to be followed.

One of the tasks of the occupational safety and health specialist is to monitor constantly changing legal regulations, occupational exposure limits, etc.

Technical Help

At any time, you can get in touch with one of our PPE professionals for personalized help on the selection and use of 3M products. They can help you through the process of selecting suitable products based on your risk assessment, as well as helping you understand how to fit, use, and maintain your PPE – helping you to stay protected.

References and Resources

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