



## METAL FUME FEVER

### OVERVIEW

Metal Fume Fever is the name for an illness that is caused primarily by exposure to zinc oxide fume (ZnO) in the workplace. The main cause of this exposure is usually breathing the fumes from welding, cutting, or brazing on galvanized metal. Metal Fume Fever is an acute allergic condition experienced by many welders during their occupational lifetimes. Studies indicate that the most common cause of metal fume fever is overexposure to zinc fumes from welding, burning, or brazing galvanized steel. Since galvanized steel is more and more common in industry, the chances of welders having to work on it are occurring more frequently all the time. Other elements, such as copper and magnesium, may cause similar effects.

### EFFECTS OF OVEREXPOSURE

Zinc oxide fumes cause a flu-like illness called Metal Fume Fever. Symptoms of Metal Fume Fever include headache, fever, chills, muscle aches, thirst, nausea, vomiting, chest soreness, fatigue, gastrointestinal pain, weakness, and tiredness. The symptoms usually start several hours after exposure; the attack may last 6 to 24 hours. Complete recovery generally occurs without intervention within 24 to 48 hours. Metal Fume Fever is more likely to occur after a period away from the job (after weekends or vacations). High levels of exposure may cause a metallic or sweet taste in the mouth, dry and irritated throat, thirst, and coughing at the time of the exposure. Several hours after exposure, a low-grade fever (seldom higher than 102° F or 39° C). Then comes sweating and chills before temperature returns to normal in 1 to 4 hours. If you

encounter these symptoms, contact a physician and have a medical examination / evaluation. There is no information in the literature regarding the effects of long-term exposure to zinc oxide fumes.

### PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for zinc oxide fume is 5 milligrams of zinc oxide fume per cubic meter of air (mg/m<sup>3</sup>) averaged over an eight-hour work shift. NIOSH recommends that the permissible exposure limit be changed to 5 mg/m<sup>3</sup> averaged over a work shift of up to 10 hours per day, 40 hours per week, with a Short-Term Exposure Limit (STEL) of 10 mg/m<sup>3</sup> averaged over a 15-minute period. Consult the NIOSH standard, *Criteria Document for Zinc Oxide*, listed in the Information Sources for more detailed information.

### HOW TO AVOID THE HAZARD

- Keep your head out of the fumes.
- Do not breathe fumes.
- Use enough ventilation, exhaust at the arc, or both, to keep fumes and gases from your breathing zone and the general area.
- If adequacy of the ventilation or exhaust is uncertain, have your exposure measured and compared to the Threshold Limit Values (TLV) in the Safety Data Sheet (SDS) for the galvanized material.
- Never take chances with welding fumes. If none of this is adequate or practical, wear an approved respirator, air-supplied or otherwise, that adequately removes the fumes from your breathing zone.

## RESPIRATORS

Good safe practices recommend using engineering controls, such as local exhaust and/or general ventilation, to reduce the exposure level to zinc oxide fumes. However, there are times when such practices and controls are not feasible, or are in the process of being installed, or are down during periods of failure. Then respirators are needed. Respirators are often used for operations in confined spaces, such as tanks or closed vessels, and in emergency situations. Always use only respirators that are approved by the Mine Safety and Health Administration (MSHA) or by the National Institute for Occupational Safety and Health (NIOSH).

## MONITORING AND MEASUREMENT PROCEDURES

### • Eight–Hour Exposure Evaluation

Exposure measurements are best taken so the eight–hour exposure is based on a single eight–hour sample or on two four–hour samples. Several short–time interval samples (up to 30 minutes) may be used, but are not preferred. The air samples should be taken by a qualified person using approved collection methods and devices. Take the samples in the employee’s breathing zone (air that would most nearly represent that inhaled by the employee).

## INFORMATION SOURCES

National Institute for Occupational Safety and Health. *Criteria for a Recommended Standard – Occupational Exposure to Zinc Oxide*, DHEW, NIOSH Publication No. 76–104; NTIS Publication No. PB–246–693, available from National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161.

### • Short–Term Exposure Limit (STEL) Evaluation

Take the measurements during periods of maximum expected concentrations of zinc oxide fume. Take a 15–minute sample or a series of consecutive samples totaling 15 minutes. Collect the samples in the employee’s breathing zone (air that would most nearly represent that inhaled by the employee). Take a minimum of three measurements on one work shift—the highest measurement taken is an estimate of the person’s exposure.

## SUMMARY

Here are the main points when dealing with galvanized metal:

- Metal Fume Fever is the result of overexposure to zinc fumes from welding, cutting, or brazing on galvanized steel.
- Metal Fume Fever is a short–term illness with classic flu–like symptoms.
- The permissible exposure limit (PEL) according to OSHA is 5 milligrams of zinc oxide fume per cubic meter of air—always monitor and measure your breathing air.
- To avoid the illness, keep your head out of the fumes and do not breathe the fumes. Use enough proper ventilation and/or exhaust. If uncertain about the ventilation, use an approved respirator.
- There are no known long–term effects of this disease.

American Welding Society (AWS) Study. *Fumes and Gases in the Welding Environment*, available from American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33136

American Conference of Governmental Industrial Hygienists publication, *Threshold*

*Limit Values (TLV) for Chemical Substances and Physical Agents in the Workroom Environment*, available from American Conference of Governmental Industrial Hygienists (ACGIH), 1330 Kemper Meadow Drive, Cincinnati, OH 45240.

Occupational Safety and Health Administration (OSHA). Code Of Federal Regulations, Title 29 Labor, Chapter XVII, Parts 1901.1 to 1910.1450, Order No. 869-019-00111-5, available from Superintendent of Documents, U.S. Government Printing Office, P.O. Box 371954, Pittsburgh, PA 15250.

American Conference of Governmental Industrial Hygienists, *Documentation of the Threshold Limit Values and Biological Exposure Indices*, available from American Conference of Governmental Industrial Hygienists (ACGIH), 1330 Kemper Meadow Drive, Cincinnati, OH 45240.

**The following references include the specific precautionary methods used to protect against exposure to fumes and gases:**

American National Standards Institute (ANSI). *Safety in Welding, Cutting, and Allied Processes*, Z49.1, available from American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33136.

National Institute for Occupational Safety and Health (NIOSH). *Safety and Health in Arc Welding and Gas Welding and Cutting*, NIOSH Publication No. 78-138, available from National Institute for Occupational Safety and Health, Robt. Taft Labs, 4676 Columbia Pkwy, Cincinnati, OH 45226.

American National Standards Institute (ANSI). *Method for Sampling Airborne Particulates Generated by Welding and Allied Processes*, F1.1, available from American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33136.