



Fumes and Gases

INTRODUCTION

Many welding, cutting, and allied processes produce fumes and gases, which may be harmful to your health.

- Fumes are solid particles which originate from welding consumables, the base metal, and any coatings present on the base metal.
- In addition to shielding gases that may be used, gases are produced during the welding process or may be produced by the effects of process radiation on the surrounding environment.
- Acquaint yourself with the effects of these fumes and gases by reading the Safety Data Sheets (SDSs) for all materials used (consumables, base metals, coatings, and cleaners).
- For help, consult a qualified person such as an industrial hygienist.
- The amount and composition of these fumes and gases depend upon the composition of the filler metal and base material, welding process, current level, arc length, and other factors.

POSSIBLE EFFECTS OF OVER-EXPOSURE

- Depending on the material involved, the effects range from irritation of eyes, skin, and respiratory system to more severe complications.
- Effects may occur immediately or at some later time.
- Fumes can cause symptoms such as nausea, headaches, dizziness, and metal fume fever. Welding fume is on the International Agency for Research on Cancer (IARC) list as posing a lung cancer risk to humans.
- The possibility of more serious health effects exists when highly toxic materials are involved. For example, manganese overexposure can affect the central nervous system resulting in impaired speech and movement.
- In confined spaces the gases might displace breathing air and cause asphyxiation (see Fact Sheet No. 11).

HOW TO AVOID OVEREXPOSURE

- Keep your head out of the fumes.
- Do not breathe the fumes.

- Use enough ventilation or exhaust at the arc, or both, to keep fumes and gases from your breathing zone and general area.
- In some cases, natural air movement provides enough ventilation and fresh air
- Where ventilation is questionable, use air sampling to determine the need for corrective measures.
- Use mechanical ventilation to improve air quality.
- If engineering controls are not adequate to prevent overexposures, use proper respiratory protection (see Fact Sheet No. 38).
- Whenever the following materials are identified as other than trace constituents in welding, brazing, or cutting operations, and unless breathing zone sampling under the most adverse conditions has established that the level of hazardous constituents is below the allowable limits specified by the authority having jurisdiction, special ventilation precautions shall be taken: Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Mercury, Nickel, Ozone, Selenium, Silver, Vanadium. See section 5.5, Special Ventilation Concerns, ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*.
- Work in a confined space only if it is well ventilated, or while wearing an air-

supplied respirator. Fumes from welding or cutting and oxygen depletion can alter air quality causing injury or death. Be sure the breathing air is safe.

- Follow OSHA guidelines for permissible exposure limits (PELs) for various fumes.
- Follow the American Conference of Governmental Industrial Hygienists recommendations for threshold limit values (TLVs) for fumes and gases.
- Have a qualified person such as an industrial hygienist check the operation and air quality and make recommendations for the specific welding or cutting situation.

INFORMATION SOURCES

Occupational Safety and Health Administration (OSHA). *Code of Federal Regulations*, Title 29 Labor, Parts 1910.1 to 1910.1450, available from the U.S. Government Printing Office, 732 North Capital Street NW, Washington, DC 20401 (telephone: 800-321-6742; Web site: www.osha.gov).

American Conference of Governmental Industrial Hygienists (ACGIH). *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*, available from ACGIH, 1330 Kemper Meadow Drive, Cincinnati, OH 45240-1634 (telephone: 513-742-2020; Web site: www.acgih.org).

American Welding Society (AWS). *Fumes and Gases in the Welding Environment* and other welding related safety and health publications, published by the American Welding Society, 8669 NW 36 Street, #130, Miami, FL 33166; telephone 800-443-9353; Web site: www.aws.org.

Mine Safety and Health Administration (MSHA). *Code of Federal Regulations*, Title 30 Mineral Resources, Parts 1 to 199, available from the U.S. Government Printing Office, 732 North Capitol Street NW, Washington, DC 20401; telephone: 202-693-9400; Web site: www.msha.gov.

American National Standards Institute (ANSI). *Safety in Welding, Cutting, and Allied Processes* (ANSI Z49.1), published by the American Welding Society, 8669 NW 36 Street, #130, Miami, FL 33166; telephone 800-443-9353; Web site: www.aws.org.

American Welding Society (AWS). *Safety and Health Fact Sheets*, published by the American Welding Society, 8669 NW 36 Street, #130, Miami, FL 33166; telephone 800-443-9353; website: www.aws.org.

For specific information, refer to the applicable Safety Data Sheet (SDS) available from the manufacturer, distributor, or supplier.

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