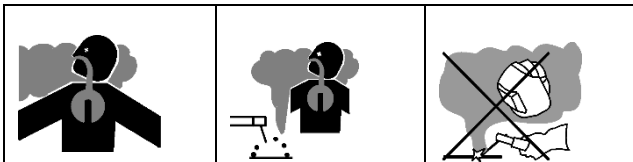


Ventilation for Welding and Cutting

INTRODUCTION

Ventilation is used to control overexposures to the fumes and gases during welding and cutting. Adequate ventilation will keep the fumes and gases from the welder's breathing zone.

NOTE: This safety and health fact sheet does not address ventilation in confined spaces. Also, the term "welding" includes "cutting."



NATURE OF THE HAZARD— THE FUME PLUME

The heat of the arc or flame creates fumes and gases (fume plume). Fumes contain respirable particles. Gases include the shielding gas, and combustion products. The heat from the arc or flame causes the fume plume to rise.

Fumes contain hazardous substances. Overexposure to them may cause acute (short term) or chronic (long term) health effects. Fumes and gases may be produced at toxic levels and they can displace oxygen in the air causing asphyxiation. Overexposure to welding fumes and gases can cause dizziness, illness, and even unconsciousness and death.

HOW TO AVOID THE HAZARD — VENTILATION

Keep your head out of the fumes. Reposition the work, your head, or both to keep from breathing the fumes.

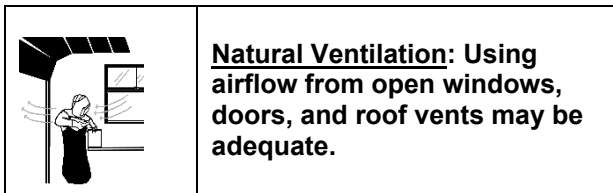
Use ventilation to control the fumes and gases produced from cutting and welding. Adequate ventilation keeps exposures to airborne contaminants below allowable limits. Have a technically qualified person evaluate the exposure to determine if the ventilation is adequate. Wear an appropriate NIOSH approved respirator when ventilation is not adequate or practical.

Adequate ventilation depends on many factors including:

- Size, shape and ambient conditions of the workplace
- Number and type of operations
- Contents of the fume plume
- Position of the worker's and welder's head
- Type and effectiveness of the ventilation

Adequate ventilation can be obtained through natural or mechanical means or both.

Natural Ventilation – is the movement of air through a workplace by natural forces. Roof vents, open doors and windows provide natural ventilation. The size and layout of the area/building can affect the amount of airflow in the welding area. Natural ventilation can be acceptable for welding operations if the contaminants are kept below the allowable limits.



Mechanical Ventilation – is the movement of air through a workplace by a mechanical device such as a fan. Mechanical ventilation can be more effective than natural ventilation. Local exhaust, local forced air, and general ventilation are examples of mechanical ventilation.

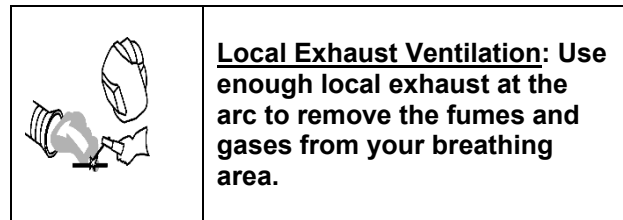
Local exhaust ventilation systems include a capture device, ducting and a fan. The capture devices remove fumes and gases at their source. Fixed or moveable capture devices are placed near or around the work. They can keep contaminants below allowable limits.

One or more of the following capture devices are recommended:

- Vacuum nozzle at the arc
- Fume hoods
- Gun mounted fume extractor

Some systems filter the airflow before exhausting it. Properly filtered airflow may

be recirculated. Caution: filtration does not remove gases.



Local forced air ventilation is a local air moving system. A fan moves fresh air horizontally across the welder's face. A wall fan is an example of Local Forced Air Ventilation.

When using localized ventilation, remember:

- Locate the hood as close as possible to the work.
- Position the hood to draw the plume away from the breathing zone.
- Curtains can be used to direct airflow.
- Some toxic materials or chemicals may require increased airflows.
- Velocities above 100 feet per minute at the arc or flame may disturb the process or shielding gas.
- The capture device can depend on the type of job.

SUMMARY

Adequate ventilation removes the fumes and gases from the welder's breathing zone and general area. It prevents overexposure to contaminants. Approved

respirators may be required when ventilation is not adequate. To minimize worker overexposure to fumes and gases:

- Keep your head out of the fumes, and do not breathe the fumes.
- Reposition the work and your head to avoid the fumes.
- Choose the correct ventilation method(s) for the specific operation.
- Use enough ventilation, exhaust at the arc, or both, to keep fumes and gases from your breathing zone and the general area.
- Understand what is in the fumes.
- Have a technically qualified person sample your breathing air and make recommendations.
- Keep hazardous air contaminants below allowable limits.
- Wear the proper respirator when necessary.

INFORMATION SOURCES

ACGIH, *Industrial Ventilation – A Manual of Recommended Practice*, American Conference of Governmental Industrial Hygienists <www.acgih.org>.

ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*, American National Standards Institute, <www.aws.org>.

AWS F3.2, *Ventilation Guide for Weld Fume*, American Welding Society <www.aws.org>.

EWI NSRP Report No. 43149GTH, *Reduction of Worker Exposure and Environmental Release of Welding Emissions*, November 30, 2003, Edison Welding Institute <www.ewi.org>.

NFPA 51B, *Standard for Fire Prevention during Welding, Cutting, and Other Hot Work*, National Fire Protection Association, <www.nfpa.org>.

OSHA, *OSHA Technical Manual (OTM)*, Section III Health Hazards, Chapter 3 Ventilation Investigation, Occupational Safety and Health Administration, <www.osha.gov>.

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