

WELDING SAFETY

MODULE 2 – FUMES & GASES

FREQUENTLY ASKED QUESTIONS

Q: What compounds are found in common welding fumes?

A: The most common compounds in arc welding fumes from mild steel are iron, manganese and silicon, although other compounds in the electrode or on the base metal may be in the welding fumes.

Q: What types of electrode products are likely to have chromium or nickel in the welding fumes?

A: Fumes from the use of stainless steel and hardfacing products contain chromium and/or nickel.

Q: What are the potential health effects that may result from long-term overexposure to chromium and/or nickel?

A: Some forms of these metals are known or suspected to cause lung cancer in processes other than welding, and asthma has been reported. Therefore, it is recommended that precautions be taken to keep exposures as low as possible.

Q: What are the potential health effects that may result from sustained overexposure to manganese?

A: Manganese overexposure may affect the central nervous system, resulting in poor coordination, difficulty in speaking, and tremor of arms or legs. This condition is considered irreversible.

Q: What are the long-term health effects associated with exposure to welding fumes?

A: This depends on the electrode and other factors. Check the LH7018 [SDS sheet], including comments on siderosis and irritation of nose and throat.

Q: What are the potential health effects that may result from overexposure to zinc?

A: Overexposure to zinc may cause fume fever with symptoms similar to the common flu.

Q: What is a common source of zinc in welding fumes?

A: Zinc in welding fumes usually comes from welding galvanized steel.

Q: Where can you find safety instructions regarding welding products that you use?

A: Each welding power source and container of consumable product has a warning label which contains specific safety instructions regarding the arc welding product you have chosen to use.

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Q: What information is contained on a Safety Data Sheet (SDS)?

A: It contains:

- a) Additional information including a summary of the Hazardous Materials used to manufacture the product
- b) A summary of Fire and Explosion Hazard Data, Health Hazard Data and Reactivity Data
- c) Information on the precautions to observe for the Safe Handling and Use of the product

Q: Where can you find the SDS for the consumable product you are using?

- A:**
- a) Inside each container of a Lincoln Electric consumable.
 - b) It can also be found on the Lincoln Electric website
 - c) On the American Welding Society website
 - d) From your supervisor

Q: Since fumes and gases can be dangerous to your health, what three steps should you take to protect yourself?

- A:**
- a) Keep fumes and gases from your breathing zone and general area.
 - b) Keep your head out of the fumes.
 - c) Use enough ventilation, or exhaust at the arc, or both, to keep fumes and gases from your breathing zone and general area.

Q: What additional precautions should be followed for products that require special ventilation?

A: If special ventilation products are used indoors, use local exhaust. If special ventilation products are used outdoors, a respirator may be required.

Q: What types of products generally require special ventilation?

A: Hardfacing and stainless products.

Q: What are the potential health hazards related to shielding gases used in arc welding?

A: Most of the shielding gases (argon, helium, and carbon dioxide) are nontoxic, but they can displace oxygen in your breathing air, causing dizziness, unconsciousness, and possibly death. Carbon monoxide can also be present and may pose a hazard if levels are excessive.

Q: What is one of the most basic safety precautions that welders can take to protect themselves from overexposure to welding fumes?

A: Keep your head out of the fume plume!

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Q: Where is the concentration of fumes and gases greatest?

A: The concentration of fumes and gases is greatest in the plume.

Q: How can you keep fumes and gases away from your breathing zone?

A: Keep fumes and gases from your breathing zone and general area using natural ventilation, mechanical ventilation, fixed or moveable exhaust hoods or local exhaust at the arc.

Q: What precautions must be taken if adequate ventilation cannot be provided?

A: It may be necessary to wear a NIOSH approved respirator if adequate ventilation cannot be provided.

Q: Does OSHA require engineering or workplace controls be installed before respirators can be used?

A: OSHA requires that engineering and workplace controls be installed first and, if the controls alone do not keep exposures below applicable limits, used with respirators.

Q: How can a welder determine if there is adequate ventilation?

A: As a practical rule of thumb for welders, for many mild steel electrodes, if the welder is comfortable and the air is visibly clear, the welder has adequate ventilation. However, a welder's exposure can only be determined by having a qualified professional take a sample of your breathing air zone during a workday.

Q: What method is used to accurately measure a welder's exposure to welding fumes?

A: A welder's exposure can only be determined by having a qualified professional take a sample of your breathing air during the workday.

Q: When is it most important to measure a welder's exposure to welding fumes?

A: Measuring a welder's exposure to welding fumes is essential if you are welding with stainless, hardfacing or other special ventilation products (see the product label).

Q: What precautions should be taken when welding a base metal which is plated or painted?

A: If the base metal cannot be cleaned before welding, the composition of the coating should be evaluated.

Q: What should you do if you feel overexposed to welding fumes?

A: Stop welding and get some fresh air immediately. If you continue to feel the symptoms, see your doctor. Notify your supervisor and coworkers so the situation can be corrected and other workers are aware of and can avoid the hazard. Be sure you are following safe practices, as stated on the consumable labeling and SDS, and improve the ventilation in your area. Do not continue welding until the situation has been corrected.

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Q: What does adequate ventilation mean?

A: Your work area has adequate ventilation when there is enough ventilation and/or exhaust to control worker exposure to hazardous materials in the welding fumes and gases so the applicable exposure limit for those materials is not exceeded.

Q: What are the most commonly used exposure limits?

A: The two most common U.S. exposure limits are established by OSHA in the form of Permissible Exposure Limits or PEL and by the ACGIH in the form of Threshold Limit Values or TLV.

Q: What exposure limit is mandatory in the U.S.?

A: Your employer must keep exposures below the PEL.

Q: Where can you find the applicable limits for the PEL and TLV for substances in welding fumes?

A: The PEL and TLV are listed on the first page of the SDS for compounds in each electrode or flux.

Q: What is natural ventilation?

A: Natural ventilation is the movement of air through the workplace caused by natural forces. Outside, this is usually the wind. Inside, this may be the flow of air through open windows and doors.

Q: What is mechanical ventilation?

A: Mechanical ventilation is the movement of air through the workplace caused by an electrical device such as a portable fan or permanently mounted fan in the ceiling or wall.

Q: What is local exhaust?

A: Local exhaust is a mechanical device used to capture welding fumes at or near the arc and remove contaminants from the air.

Q: What factors need to be considered when determining the exhaust requirements for your application?

A: The ventilation or exhaust needed for your application depends upon many factors, such as:

- Workspace volume
- Workspace configuration
- Number of welders
- Welding process and current
- Consumables used (mild steel, hardfacing, stainless, etc.)
- Allowable levels (TLV, PEL, etc.)
- Material welded (including paint or plating)
- Natural airflow

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Q: Name several types of local exhaust that can be used to control exposure to welding fumes.

A: Local exhaust of welding fumes can be provided by any of the following: adjustable “elephant trunk” exhaust systems; fume extraction guns; or fixed enclosures or booths with exhaust hoods.

Q: Which system is more effective and economical: general ventilation or local exhaust systems?

A: Local exhaust systems are more effective and economical to operate than a general ventilation system, particularly in the winter, because they require less replacement air to be brought into the room and heated.

Q: What is the minimum air velocity (speed) required near the welding arc?

A: Minimum required air velocity at the welding arc is 100 fpm.

Q: When should an employee’s exposure to welding fumes be obtained?

A: Exposure should be checked when new ventilation equipment is installed, the process is modified or the welder feels uncomfortable. Periodically, exposure should be rechecked to be sure it is still working properly and is adequate.

Q: What must be done to ensure that there is adequate ventilation when welding with stainless or hardfacing consumables on lead or cadmium plated steel and other metals or coatings, like galvanized steel, which produce hazardous fumes?

A: Keep exposure as low as possible and below exposure limit values (PEL and TLV) for materials in the fumes using local exhaust. A respirator should be used unless exposure assessments confirm that ventilation is adequate to control worker exposure.

Q: When should a respirator be used?

A: In confined spaces or in some circumstances, for example outdoors, a respirator may be required if exposure cannot be controlled to the PEL or TLV.

Q: When does OSHA consider natural ventilation sufficient?

A: According to OSHA regulations, when welding and cutting (mild steels), natural ventilation is usually considered sufficient to meet requirements, provided that:

- The room or welding area contains at least 10,000 cubic feet (283 m³) [about 22' x 22' x 22'] for each welder.
- The ceiling height is not less than 16 feet.
- Cross ventilation is not blocked by partitions, equipment, or other structural barriers.
- Welding is not done in a confined space.
- Regardless of whether the ventilation meets these requirements, the welder’s exposure must be controlled to below the PEL or TLV (if applicable) exposure limit to be adequate.