OFFICE OF TECHNICAL ASSISTANCE & TECHNOLOGY

Safe Welding Practices

Welding fumes contain both metals (cadmium, chromium, lead, etc.) and gases (carbon monoxide, phosgene, argon, etc.) that can be harmful to workers. Welding can create highly toxic hexavalent chromium fumes that can damage the eyes, skin, throat and lungs. Long-term exposure can cause cancer, Parkinson's disease, or Manganism ("welder's disease"). Shop owners must implement safety equipment and procedure to ensure that workers can perform their jobs as safely as possible.

Important Safety and Health Practices

Your customers' lives depend on the strength of your shop's welding job. However, your workers' lives also depend on the strength of your shop's welding safety standard operating procedures and control measures. OSHA welding requirements can be found at: OSHA 29 CFR 1910.252.

Provide local exhaust ventilation
Local ventilation, such as a fume extractor (see photo) will help prevent welder and worker exposure to welding fumes in your shop. This type of mechanical ventilation is the primary control for keeping concentrations of harmful fumes below OSHA's Personal Exposure Limits (PEL).

This portable fume extractor features an adjustable arm that pulls welding fumes away from the welder's personal breathing zone.

Photo courtesy of Montachusett Vocational Technical School.

Ensure employees wear appropriate respirators
Respirators are highly recommended, regardless of PEL levels, since even exposure to small amounts of welding fumes can be very harmful over time. OSHA requires the use of respirators if ventilation does not bring air contaminant levels PEL (OSHA 29 CFR 1910.252). Choosing the correct type of respirator is based on the working specific conditions such as welding in a confined space verses welding outdoors.

For example, if the ventilation system within an auto body shop is not enough to reduce exposures below enforceable and recommended limits, an air-purifying respirator with combination cartridges including P100 filters with organic vapor protection would be appropriate. At the minimum, the welder should be wearing a P95 particle respirator or better because MIG welding, either aluminum or steel causes fumes in particle form. However, organic vapor cartridges add an element of protection from other materials, such as solvents and paints that might be present in service stations. In situations where it is impossible to provide any ventilation (e.g., welding in a confined space, such as inside a vehicle), a supplied-air respirator would be necessary to be in compliance with OSHA 29 CFR 1910.252(c)(4). The American Welding Society has a fact sheet that describes selecting appropriate respiratory protection.

OSHA requires that you have a written Respiratory Protection Program. This means that workers must be trained, fit tested and medically approved to wear respirators. Tips on how to set up a Respiratory Protection Program can be found on page 4 of OSHA's Respiratory Protection guidance.

Only weld clean surfaces
Welding surfaces should be cleaned of any coating that could potentially create toxic exposure, such as solvent residue and paint. There is a danger of heating and re-releasing harmful isocyanates from painted surfaces or creating deadly phosgene gas if a surface is wet with methylene chloride. If welders are only wearing particulate respirators they will be exposed to these chemical mixtures that can lead to occupational asthma or even death.

> *"Welding can result in burns, eye damage, health impacts from fumes, and we want our future auto body technicians to know how to do it safely. We bought a Miller fume extractor to ensure we have proper ventilation, along with wearing a respirator with P100 filters when the extractor is not available. We also ensure our students wear the proper personal protective equipment, such as welding helmets and welding gloves, and we ensure they fully protect their skin."*
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> David Lelievre, Collision Repair Instructor, Montachusett Regional Vocational Technical High School

Protect your skin, eyes, and hair
Long leather gloves and full clothing are recommended to protect the welder's skin from sparks and heat generated by welding. Welders should cover all remaining skin but avoid polyester fabrics, which can melt into skin when exposed to high heat. Make sure that all hair is contained in a cap or bandana. A welding helmet (required by OSHA 29 CFR 1910.252(b)(2)(i)(A)) protects the welder's eyes from the bright welding light and the face from sparks and heat.

Implement fire protection measures
Your shop is required to have a fire extinguisher available (required by OSHA 29 CFR 1910.252(a)(2)(ii)) for immediate use in the event that a fire breaks out. However, take the following precautions to prevent fires:

- **Be vigilant.** Watch the welding area for at least 30 minutes (required by OSHA 29 CFR 1910.252(a)(2)(iii)(B)) after welding has been completed to ensure a fire does not develop.
- **Keep the area at least 35 feet away from flammable and combustible materials** (required by OSHA 29 CFR 1910.252(a)(2)(iii)(A)) such as oily rags, paper, hazardous waste storage areas, waste oil collection areas, paint mixing rooms, and other locations with flammable liquids.

Isolate welding area from other shop activity
By enclosing welding areas or isolating them at your shop, you can prevent or minimize exposure to other workers and bystanders. One option for doing this is using a gel curtain or wall to isolate the activity and the chemicals that welding releases into the air.
However, because using a curtain or other barrier to prevent the chemicals from escaping concentrates them in a smaller area, it is very important that the welder has an appropriate respirator (see above).

Chain and cap all compressed gas cylinders
It is important that compressed gas cylinders are stored safely such that they do not leak or fall over and injure your workers (29 CFR 1910.101(b)). You can learn more about safe cylinder handling procedures by asking your gas supplier for a copy of the "Compressed Gas Association Pamphlet P-1-1965." NIOSH also has an online checklist for compressed gases: Compressed Gases Self-Inspection Checklist

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Learn more about welding aluminum
Aluminum has its own unique hazards as aluminum dust can be explosive. Therefore, ensure your technicians have received proper training specific to aluminum welding.

Find Additional Information

- I-CAR trainers are available to teach welding technique (including aluminum welding) and safety.
- OSHA's Controlling Hazardous Fume and Gases During Welding fact sheet explains how to control hazardous fumes and gases during welding and lists OSHA regulations that must be followed.
- The American Welding Society prepared an automotive fact sheet bundle that contains information on mechanical hazards, spot welding, grounding, and welding coated steels.
- The OSHA Training Institute developed a Welding, Cutting, and Brazing PowerPoint presentation on safe and compliant welding practices.
- For more information about the health effects related to welding, see this NIOSH page on Welding and Manganese: Potential Neurological Effects.
- The Boston Public Health Commission's Safe Shops program produced a video on permits, hazardous material storage, and welding. See 6:25 to 7:51 of video for safe welding practices.

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