

OSHA Training Toolbox Talk: Cutting, Welding, & Compressed Gas Safety – Respiratory Hazards

[Reference: 1910.252 / 1926.352]

Welding, cutting, and brazing operations produce various types of toxic air contaminants that could potentially pose a threat to your health. Today's toolbox talk provides an overview of how many of the respiratory hazards associated with welding, brazing, and torch cutting operations are generated, and some steps we can take to help minimize exposure to unsafe levels of these toxic contaminants.

To understand how a solid such as metal can be a respiratory hazard, we will use water as an analogy to explain the process by which metals in a solid form become something you can breathe. When water is in its solid form, which is ice, and then exposed to high heat, it first changes to its liquid form, which is water, and then it begins to change into its gaseous form, which is water vapor. As the water vapor rises, it begins to cool and condensate, forming small droplets that drift down into your breathing zone.

The same general thing happens when metals are super-heated during welding and torching operations. The solid metal on which you weld or cut, as well as filler metals such as welding or brazing rods in use, becomes molten, or liquified. Then, some of the molten metal evaporates into the air, where it subsequently cools and forms microscopic-sized respirable particles of airborne metal flakes called fumes. When these tiny toxic particles get into your breathing zone, you can inhale them deep into your lungs.

Potentially toxic metal fumes such as, but not limited to, iron, manganese, lead, zinc, and hexavalent chromium, are generated in many welding and cutting operations. Additional toxic air contaminants can be generated by coatings present on the base metal, such as paint, rust inhibitors, galvanize coating, or paint. There are also toxic contaminants generated by gasses heated during shielded-gas welding, and by the flux coating on welding and brazing rods. Therefore, OSHA established permissible exposure limits, or PELs, for each type of airborne toxin, as well as one for a combination of all the airborne particulate.

OSHA suggests you implement the following steps, when possible, to help minimize your exposure to potentially toxic levels of air contaminants generated by welding, cutting, and brazing operations:

- Surface contaminants and coatings that can potentially create exposure to toxic fume when heated should be scraped, wiped, or otherwise cleaned off the surface to be welded or cut, when possible.
- Simply welding outdoors or in open work spaces alone does not necessarily mean the atmosphere is safe. Therefore, affected workers should try to position their head so as to prevent welding fume and gasses from entering their breathing zone. For example, try to position your body so that your head is upwind when welding in open or outdoor environments, as well as indoors if there is air movement.
- General ventilation, be it natural or mechanically forced movement of fresh air, can help reduce fume and gas levels present in your breathing zone. In areas without ventilation or exhaust systems, welders should use natural drafts along with proper positioning to avoid exposure to fume and gases.
- Local exhaust ventilation systems, when available, can remove fume and gases from the worker's breathing zone. Position fume hoods, fume extractor guns, and vacuum nozzles as close as possible to the source of the welding or cutting plume to remove the maximum amount of contaminant. Portable or flexible exhaust systems should be positioned so that fume and gases are drawn away from the worker. Position exhaust ports so that other workers in the area are not exposed to the exhaust.
- Respiratory protection devices such as respirators may be required by the employer to be used if work practices or ventilation do not reduce welding fume and other respiratory hazards to safe levels.

Does anyone have anything to add to today's discussion on the presence and control of potential respiratory hazards while conducting welding, brazing, and cutting operations? Please sign the training certification form to ensure you get credit for attending today's toolbox training session.