

All of the various types of welding techniques, from stick welding to plasma cutting, expose the welder to hazardous metal fumes and gases. Workers are commonly exposed to metal fumes, based on the composition of the base material and feed wire, ozone, nitrogen dioxide and ultraviolet radiation. However, not all welding processes generate the same concentrations of gases and fumes.

## Types of Welding



**Shielded Metal Arc Welding (SMAW or Stick)** The coated stick contains the flux which makes this type of welding portable and quick because there is no need for a wire feed system or shielding gas.

**Metal Inert Gas Welding (MIG)** A very common welding type where a consumable wire electrode is fed into the molten pool that forms the weld. Welders can weld at a rapid rate with MIG welding.

**Tungsten Inert Gas Welding (TIG)** Very similar to MIG welding except a non-consumable tungsten electrode is used along with a long welding rod as the fill metal. TIG is generally used when clean, precise welds are needed.

**Plasma Arc Welding (PAW)** Plasma is used to transfer an electric arc to the work piece that fuses the pieces together. Filler metal may or may not be necessary.

**OxyFuel or Gas Welding** A fuel gas, typically acetylene, and oxygen are used to create a torch which melts the metal pieces and filler metal to create a weld.

## Exposures: Stick vs. MIG vs. TIG vs. Plasma vs. OxyFuel

Metal fume generation depends on metal alloy composition, current density, wire feed rate and arc time. The greater the current density, wire feed rate or arc time, the greater the fume generation rate.

- Plasma welding and cutting can produce the most metal fumes and gases out of all of the common welding types due to the immense heat generated and the rapid welding rate achievable. Plasma welding can also produce more UV light.
- Stick and MIG welding generate similar fume concentrations, which are dependent on welding rate and current density. Stick welding can create unique exposures based on the composition of the flux coating.
- TIG welding generally produces lesser fume concentrations when compared to MIG and Stick welding because TIG welding is generally slower.
- OxyFuel or Gas Welding typically has the lowest risk of exposure because it's only practical on thinner metals or light repair work.

Other factors to consider: Welding on paints, coatings, cleaning solvents and certain flux types can expose welders to various other toxic contaminants, so care should be taken when preparing a welding surface.

## Exposure Control

- Local exhaust ventilation is often the primary form of exposure control. Articulating ventilation hoods can be positioned to pull welding fumes and gases away from the welder, reducing personal exposure.
- Work Practice controls can be effective—positioning relative to air movement, outdoors vs. confined areas, and proximity to other welders.
- Respiratory protection should always be considered the last line of defense.