Most welders know that the gases and fumes produced from welding are unsafe. But the health effects from breathing in those materials can vary significantly depending on the work environment, the type of welding, the material being welded, and several other factors. In addition, co-workers nearby may not be aware of the dangers and often don’t take the same precautions as welders.

Welding fumes are formed when the heated metal vapourizes and then cools. This causes small particles of metal and other material to become suspended in the air. Breathing in these particles can cause immediate health effects or serious health effects over time.

Welding fumes and gases come from:
- the welding rod
- the base metal
- paints and coatings on the metal or electrode (degreasers, etc.)
- shielding gases
- chemical reactions from ultraviolet light and heat.

The table on the next page contains a list of fumes and gases produced from welding, the places where they’re found, and the effects they can have on the human body.
• If possible, use a shielding gas that produces fewer contaminants. For example, using a mixture of argon and carbon dioxide instead of straight CO₂ has been shown to reduce welding fumes by 25 per cent.

• Use only the current, rod size, and arc length that is necessary for the job. A higher current, larger rod, and longer arc length will produce more fumes.

• Welding with reversed polarity (workpiece negative) produces more fumes than welding with straight polarity (workpiece positive). NOTE: You can only weld with straight polarity if the welding rod is compatible.

• Adjust your posture and technique. Welders who bend over close to the welding location and position themselves in the smoke plume will have a greater risk of exposure.

• Read the warning label or M(SDS) for any hazardous material you’re working with and follow the recommended safety precautions.

### Prevention

The hazards from welding fumes and gases must be recognized, assessed, and controlled or eliminated to protect workers. You may be able to eliminate them by joining metal together by some other means such as bolting them.

If it’s not possible to eliminate the hazards, implement controls at the source, along the path, or at the worker.

### At the source

- Remove paints and coatings such as rust inhibitors from areas that are to be welded. However, do not use solvents for removal because they can release other toxins when heated.
- If possible, use welding rods or electrodes made of material that releases the least amount of toxic substances.
- Take special precautions when welding in a confined space. Follow the requirements of the Confined Spaces Regulation (632/05).
- If possible, use a shielding gas that produces fewer contaminants. For example, using a mixture of argon and carbon dioxide instead of straight CO₂ has been shown to reduce welding fumes by 25 per cent.
- Use only the current, rod size, and arc length that is necessary for the job. A higher current, larger rod, and longer arc length will produce more fumes.
- Welding with reversed polarity (workpiece negative) produces more fumes than welding with straight polarity (workpiece positive). NOTE: You can only weld with straight polarity if the welding rod is compatible.
- Adjust your posture and technique. Welders who bend over close to the welding location and position themselves in the smoke plume will have a greater risk of exposure.
- Read the warning label or M(SDS) for any hazardous material you’re working with and follow the recommended safety precautions.
The type of respirator required depends on the amount of exposure and the toxicity of the fumes. Refer to IHSA’s Respirator Selection Chart in Chapter 15 of the *Construction Health and Safety Manual* (M029) to choose the correct one for the type of work being done.

**Remember:** A welder who is required to wear a respirator must be instructed in its proper fitting, use, and maintenance and must have a fit test performed.

In addition, post signs warning others of the welding hazards in the area and letting them know the protective equipment that needs to be worn.

**How IHSA can help**
IHSA has several resources to help you control welding hazards at your workplace.

- **Health and Safety Guide: Arc Welding** (B012)
- **Construction Health and Safety Manual** (M029)—Chapter 41: Welding and Cutting
- **Health and Safety Advisory: Toxic Exposure to Manganese in Welding Fume** (W156)
- **Safety Talks** (V005)
  - Welding – Inhalation Hazards
  - Lead-based Paint – Welding and Cutting