

WELDING FUMES: THEIR CHARACTERISTICS, HEALTH EFFECTS AND CONTROL

SUMMARY

The composition of welding fume is determined mainly by the filler metal and the core or coating of the electrode. If the base metal has been coated, other contaminants are generated; for example, zinc from welding on galvanized steel and lead from welding on metals painted with lead-based paint. The main constituent of the fume when welding on mild steel is iron oxide, which is a low-hazard contaminant. The greatest health concerns to welders arise from chromium, nickel, cadmium, ozone and nitrogen dioxide. Stainless steel welding can produce significant amounts of chromium and nickel in the fume.

Inhalation of welding fumes may cause short-term health effects such as metal fume fever (for example, from zinc fume) and respiratory tract irritation (for example, from ozone and fluorides). Overexposure to cadmium can cause serious lung disease.

Long-term health effects are still not fully understood, in spite of a great many studies. There are indications that long-term exposure to welding fume is associated with increased risk of chronic respiratory and skin disease (including allergic dermatitis). However, it is difficult to attribute these diseases to welding alone. Factors such as smoking and exposure to other chemicals may also play a significant role in symptom development.

The carcinogenic potential of welding fume remains a controversial issue. The fumes generated by certain welding processes contain chemical species that are known or suspected human carcinogens. Chromium VI, present in stainless steel welding fume, is the carcinogen of greatest concern. There is some evidence that welders may have a higher risk of lung cancer than non-welders. But welding fume, in particular stainless steel fume, is not yet conclusively proven to be the causative agent. Exposures to welding fumes and gases should be controlled to minimize or prevent possible long-term health effects.

The best method to control exposure to welding fume is through local exhaust ventilation. Such systems are designed to capture the fume before it reaches the breathing zone of the welder. The success of their use depends upon the welder moving the hood or nozzle so that it is always close to the welding area.

If good ventilation is not feasible, or if welding is done in a confined space, respiratory protection may be required. Selection of the correct respirator and proper use by the welder are crucial for protection.

Welders should know the type of fume to which they are exposed so that appropriate control strategies can be selected. Safe work practices should always include:

- ° staying clear of the plume
- ° removing coatings before welding
- ° isolating degreasing operations from welding processes