# The Hazards of Solder Fume

Sentry Air Systems, Inc.

July 2010


www.sentryair.com

## The Hazards of Solder Fume

Weller®, a manufacturer of welding products (among other items), explains that "at least 20% of the employees working in the soldering area show clinical symptoms of asthma caused by the work environment" in studies that have been done on workers mostly in the United States and England in the electronics industry. [3]

Soldering is the process of combining two metals via a third metal (the "joint") with a lower melting point than the base metals. In this procedure, the two base metals are not distorted and only the filler metal is melted. There are numerous filler metals, or solder, available for soldering applications. For the purpose of narrowing the content of this report, only lead-based solder and rosin-based flux will be discussed.

Although effective, these two forms of solder create fumes that pose serious health risks if not managed properly.

## Lead-based Solder

Many popular solders are manufactured with lead, a well-known metal with

dangerous health hazards.

According to OSHA:

“Lead is used in the soldering process in the form of lead/tin and lead/silver filler metals. When heated, lead oxide fumes are formed. Excessive exposure to lead oxide fumes can result in lead poisoning. Symptoms include loss of appetite, indigestion, nausea, vomiting, constipation, headache, abdominal cramps, nervousness, and insomnia. According to Kirk-Othmer, lead is absorbed through the mucous membranes of the lung, stomach, or intestines and then enters the bloodstream.” [1]

"Symptoms include metallic taste in the mouth, loss of appetite, nausea, abdominal cramps, and insomnia. In time, anemia and general weakness, chiefly in the muscles of the wrists, develop. Lead adversely affects the brain, central nervous system, circulatory system, reproductive system, kidneys, and muscles." [5]

## Rosin-based Flux

*Flux* is a chemical cleaning agent that is used in conjunction with solder in order to remove oxidation from the base and filler metals involved in soldering. It improves the overall flow and effectiveness of the solder. Rosin-based flux is made from extracts of pine tree sap and can cause health problems if fumes from soldering are inhaled. According to the WorkSafe Western Australia Commission, “short term problems can include nose, sinus, eye and throat irritation and skin rashes, and long term problems may include asthma and dermatitis.” [2]

Colophony is the base product of flux. As explained by Weller®, "Colophony is the translucent amber-colored rosin obtained when turpentine is distilled from resin of pine trees." It is composed of roughly 90% resin acid and 10% neutral

material. When the flux is heated, colophony has been known to generate fumes including aliphaticaldehydes (like formaldehyde) and "hydrochloric acid and other gases containing benzene, toluene, styrene, phenol, chlorophenol and isopropyl alcohol." [3]

The health hazards associated with solder fumes create long-term discomfort and illness for employees and results in increased employee absence, turn-over and a high number of worker claims for damages (Weller® cites that "90% of all claims in the United States related to soldering occupations involving respiratory diseases are litigated." [3])

## Your Rights as an Employee

The Occupational Safety and Health Act of 1970 states that "employers are responsible for providing safe and healthful workplaces for their employees." [6] It is the employee's right to inform the employer of workplace health hazards like poor ventilation during soldering. (The Whistleblower Protection Program protects employees who raise health and safety issues to their employers [7]).

## Ventilation

Because of the high risk of worker/operator exposure during soldering, OSHA suggests Ventilation as a key to controlling lead exposures:

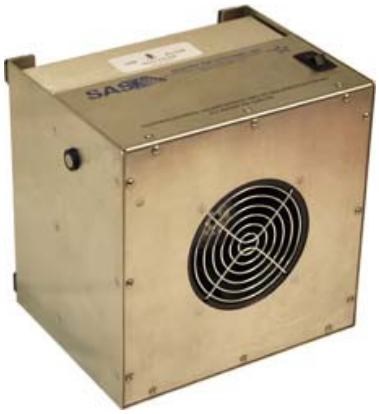
"Ventilation, either local or dilution (general), is probably the most important engineering control available to the safety and health professional to maintain airborne concentrations of lead at acceptable levels. Local exhaust ventilation, which includes both portable ventilation systems and shrouded tools supplied with ventilation, is generally the preferred method. If a local exhaust system is properly designed, it will capture and control lead particles at or near the source of generation and transport these particles to a collection system before they can

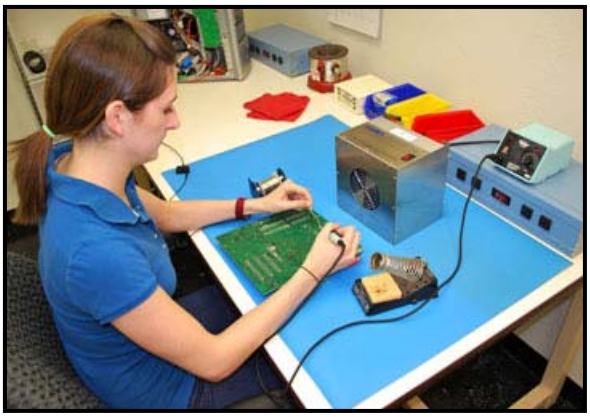
be dispersed into the work environment.” [4]

Source capture also works effectively for soldering that does not involve lead-based solder. Organizations from The Health and Safety Executive of Great Britain to solder equipment manufacturers, like Weller®, suggest a fume extraction system while soldering.

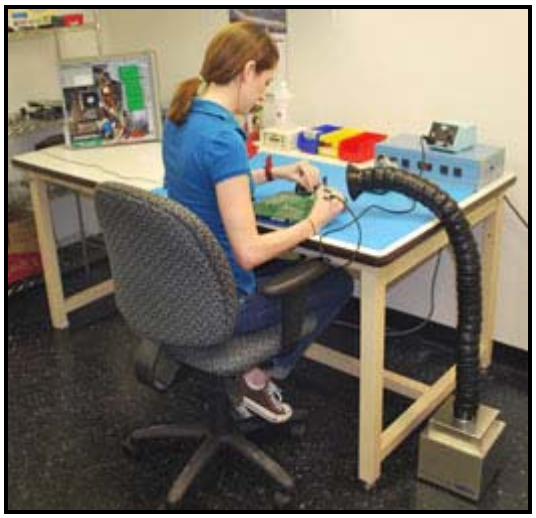
## Products

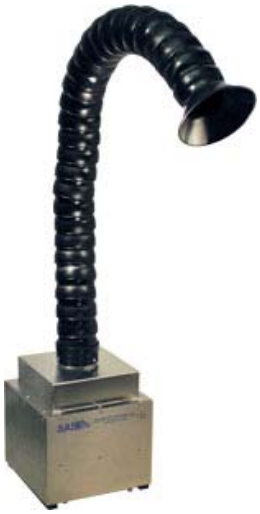
Sentry Air Systems offers numerous fume extraction systems for soldering, including bench-top, portable, and wall-mounted units.



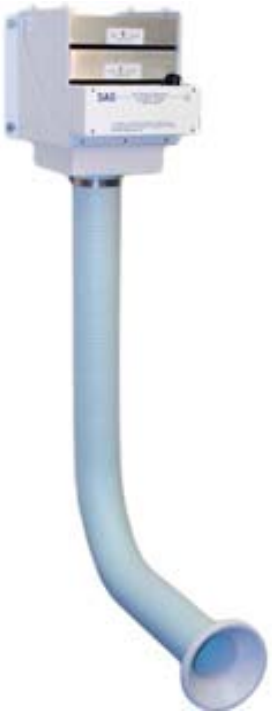


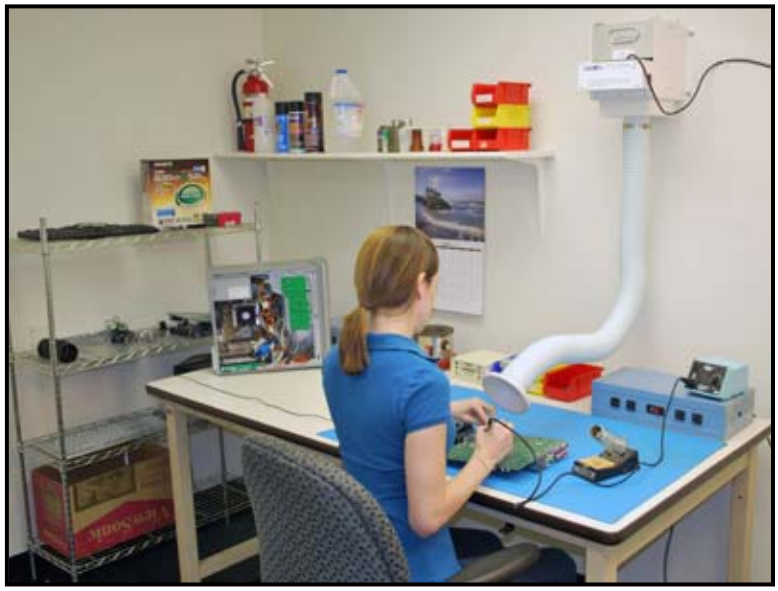
^The **Stainless Steel Solder Sentry [Model SS-100-SS-ST]** is perfect for desk-top soldering. This ESD-safe unit is equipped with a powerful fan and filtration system that captures contaminants and redistributes them as purified air.





^The **Stainless Steel Floor Sentry [Model SS-100-FS-ST]** is an optimal choice when soldering is being done in a small or limited workspace. This ESD-Safe unit features a semi self-supportive flex arm for source capture.





^The **Sky Sentry [SS-200-SKY]** is designed to hang over the workspace area to capture particulate. The semi self-supportive flex allows the operator to place the source capture area where it is needed the most.

Sentry Air offers several unit options as well as filtration options based on your particular application. One of our Applications Specialists will assist you in choosing the particular unit that is best fitted for your needs. You can reach us at **800.799.4609** or you can email us at ***sales@sentryair.com***.

**This document has been compiled in good faith by Sentry Air Systems, Inc. and no representation is made as to the completeness or accuracy of the information it contains. In particular, you should be aware that this information may be incomplete, may contain errors or may have become out of date. Sentry Air Systems, Inc. makes no commitment, and disclaims any duty, to update any of this information.

References

[1] Occupational Safety & Health Administration, "ICP Backup Data Report for Soldering and Brazing Matrices (ARL 3560)". <http://www.osha.gov/dts/sltc/methods/inorganic/id206arl3560icp/id206arl3560icp.html>

[2] Government of Western Australia, "Soldering in the Workplace: Rosin Fluxes". <http://www.commerce.wa.gov.au/worksafe/PDF/Guidance_notes/Guide-soldering_and_rosin_fluxes.pdf>

[3] Weller ®, "Health Hazards from Inhaling and Exposure to Soldering Fumes". <http://www.elexp.com/tips/Health_Hazards.PDF>

[4] Occupational Safety & Health Administration, OSHA Technical Manual, Section V, Chapter 3, "Controlling Lead Exposures in the Construction Industry: Engineering and Work Practice Controls". <http://www.osha.gov/dts/osta/otm/otm_v/otm_v_3.html#2>

[5] Occupational Safety & Health Administration, "Welding Health Hazards". <http://www.osha.gov/doc/outreachtraining/htmlfiles/weldhlth.html>

[6] Occupational Safety & Health Administration, "Occupational Safety and Health Act of 1970". <http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=OSHACT&p_id=2743>

[7] Occupational Safety & Health Administration, "The Whistleblower Protection Program". <http://www.osha.gov/dep/oia/whistleblower/index.html>