

-- **INDEX** ≡

Health and Safety Executive		Sector Information Minute	
Manufacturing		SIM 03/2002/26	
Cancellation Date	23/08/2006	Open Government Status	Fully Open
Version No & Date	1: 23/08/2002	Author Unit/Section	Engineering & Utilities Sector, Newcastle-upon-Tyne

Target Audience
All FOD Inspectors

SHORT AND INTERMITTENT EXPOSURE TO ROSIN-BASED SOLDER FLUX FUME: WHEN EXPOSURE MAY NEED FURTHER ASSESSMENT AND CONTROL

This SIM gives guidance on some of the factors which affect exposure to fume during manual soldering to help inspectors decide whether exposure is likely to be a problem, and whether suitable control measures are in use. This guidance is based on a small study, when exposure was measured during repair of domestic electrical equipment, and provides broad pointers only. It is not intended to replace the employer's COSHH assessment.

BACKGROUND

1 Rosin-based solder flux fume (RBSFF) is among one of the top eight substances which have been identified as causing or exacerbating occupational asthma. It has been selected as a FOD priority topic asthmagen for Revitalising Health and Safety. Early symptoms from fume exposure can include watering prickling eyes, running or blocked nose, sore throat, coughing, wheezing, tight chest and breathlessness. Dermatitis can result from skin exposure to the fume or flux.

2 Rosin is often used as a flux core in solder wire. It is a very good fluxing agent which cleans the area to be jointed, and enables the other solder components to flow into the joint. Historically, RBSFF was referred to as colophony fume and this term is still used in some workplaces.

3 RBSFF has been assigned a long term and short term maximum exposure limit (MEL). A MEL is set for substances which may cause the most serious health effects, such as occupational asthma, and for which 'safe' levels of exposure cannot be determined. Concentrations of RBSFF are averaged over a specified period of time. Two time periods are used: long term (8 hours) and short term (15 minutes). Short-term exposure limits (STELs) are set to help prevent effects, such as eye irritation, which may occur after a brief exposure. The MELs for RBSFF are a long-term average of 0.05 mg/m³, and a STEL of 0.15 mg/m³.

REDUCING ROSIN-BASED SOLDER FLUX FUME AT SOURCE

4 Substituting solder with a non rosin-based flux would be the preferred control measure. The repair engineers met in this study are reluctant to do so. They feel that alternative substances do not offer satisfactory performance and that the joints produced are weaker and more likely to fail during use. Inspectors should also note that even if a solder does not contain rosin, it is not necessarily risk free and a thorough assessment of the health risks is still required.

5 Automated soldering, such as wave soldering, usually causes less exposure than manual soldering. However, manual soldering is essential in the domestic electrical equipment repair sector, and elsewhere during the rework of components.

MEASURING EXPOSURE

6 Measurements were made of exposures to total resin acids during the repair of domestic electrical equipment (mainly radio, TV, hi-fi and video equipment) in four premises. The main activity at these premises was retail sales, the repair activities forming the minor activity. Three of the premises were relatively large and well ventilated whereas the fourth was small with a low ceiling, small windows and poor natural ventilation. Repair work done in all four premises was of a similar nature and duration.

7 A survey of work carried out at these four sites revealed that soldering took place for less than one hour per week, and often for less than half an hour per week. The maximum time for any particular job varied, but was rarely more than four minutes and often no more than two minutes.

8 Sampling was done in accordance with *Resin acids in rosin (colophony) solder flux fume: laboratory method using gas chromatography* MDHS 83. Because soldering in these premises was intermittent and of short duration, this amounted to no more than two minutes of the 15 minute sample time.

RESULTS

9 At the first three well-ventilated premises, personal exposures and background concentrations were below the limits of detection. However at the final poorly ventilated site one personal exposure (0.713 mg/m^3) well exceeded the STEL of 0.15 mg/m^3 .

10 Preliminary work for this study measured the personal exposures of repair engineers while they soldered constantly for 15 minutes or more with no local exhaust ventilation (LEV) in use. There was an almost 50 fold difference in exposure between the highest and lowest readings. Observation of the operators while they were soldering suggests that the largest single factor influencing exposure is the position of the operators breathing zone relative to the plume of solder fume. The operators with the highest measured exposure tended to work with their faces directly above the soldering job, while those with the lowest exposure tended to sit slightly back from the soldering job.

DISCUSSION AND GUIDANCE

11 Personal exposure to rosin-based solder flux fume depends on a number of variables. The actual time spent soldering is important. Evidence obtained from the domestic electrical repair industry indicates that when periods of soldering are generally short and intermittent the STEL is unlikely to be exceeded. However, the overall level of exposure will be affected by the position of the operator's breathing zone relative to the plume of solder, the size of the work room, the provision of general ventilation and the use of LEV, etc.

12 Where soldering lasts for 15 minutes or longer, it is likely that the STEL will be exceeded unless appropriate control measures are in use. Primarily, the provision of good general ventilation and ensuring a good working position relative to the fume.

13 In small poorly ventilated workrooms the STEL can be exceeded even for short duration soldering, and possibly even the long-term exposure limit where there is a heavy workload in this time. In such situations, exposure should be controlled by the use of LEV, eg tip extraction, flexible arm extraction or a fume absorber unit.

14 RBSFF has the potential to cause occupational ill health in susceptible individuals, even at low levels of exposure. Inspectors should ensure that employers have some system of health surveillance in place, such as use of the pre-exposure and periodic questionnaires appended to *Preventing asthma at work: how to control respiratory sensitisers* (L55). Further information will also be available in the occupational asthma appendix to the general COSHH ACoP (L5), which is due to be published soon.

Date first issued: 23 August 2002

TOP A