

Welding safety

HEALTH EFFECTS CAUSED BY INHALATION OF POLYVINYL CHLORIDE (PVC) FUMES

When tested in 1989, PVC roofing membranes contained antimony trioxide, lead phosphite, titanium dioxide, diethyl hexyl phthalate, ester of phthalic acid (C9 - C11) and bio-stabiliser. Membranes are joined by welding with hot air (machine welding at 200°C and hand welding at 400°C). The results from measuring the welders' exposure in a poorly ventilated room are available in the table overleaf.

The exposure to fumes is well below the current Norwegian TLV for total organic dust when working in poorly ventilated rooms (background level 6.4 mg/m³).

HEALTH EFFECTS

In the middle of the 1970s, PVC fumes were suggested as the cause of "meat wrapper asthma" (in meat wrapping, PVC is cut by a wire heated to about 105°C and labelling is done at a temperatures between 200°C and 210°C). Since that time, a number of well-controlled epidemiological studies have been carried out. These studies showed that while there is some evidence of small airway obstruction of limited duration and severity, this appears to be a nonspecific reaction not related to sensitisation. There does not appear to be any long term cumulative effects from exposure to PVC pyrolysis fumes.

Most individuals who develop symptoms have pre-existing chronic bronchitis or asthma and should avoid further exposure, particularly if the work environment is poorly ventilated.

HEALTH AND SAFETY EVALUATION

No significant amounts of toxic substances were detected. The exposure may therefore be considered as organic nuisance dust. The exposure of nuisance dusts have a long history of little effect on lungs and do not produce significant organic disease or toxic effects when the exposure is kept under reasonable control. A measure often used of reasonable control is keeping the exposure below 50% of the current TLV.

The exposure measured is to be regarded as the maximum level attainable if the welding was done in a poorly ventilated room. Exposure, when welding in open air, will be considerably lower - most probably below the current TLV.

Welding in open air will cause few - if any - cases of passing airway obstruction. Individuals with chronic bronchitis or asthma are at greatest risk. Cumulative effects do not appear likely.

RECOMMENDATIONS

The use of respiratory protection will eliminate any risks when working in poorly ventilated, confined areas. A half-mask with a combination filter for dusts (P2), organic vapours (A2) and acid vapours will give adequate protection.



COMPONENTS	TLV4 (1996) (MG/M ³)	MACHINE 60M EXPOSURE (MG/M ³)	HAND 25M EXPOSURE (MG/M ³)
Total organic dust	5	14.4	5.4
Lead	0.05	0.007	0.007
Antimony	5	1.6	0.1
Ester of phthalic acid (C9-11)	5	1.6	0.1
Diethyl hexyl phthalate	3	<0.4	<0.3
Hydrochloric acid	7	0.12	0.12
Formic acid	9	<0.03	<0.3
Acetic acid	25	<0.03	<0.3
Smorsyre		<0.03	<0.3
Propionic acid	30	<0.03	<0.3
Other organic acids		<0.03	
Formaldehyde	0.6	<0.2	<0.2
Acetaldehyde	45	<0.2	<0.2
Acrolein	0.25	<0.2	<0.2
Other aldehydes		<0.5	<0.2
Vinyl chloride	3	<0.03	<0.3
Benzene	3	<0.03	<0.2
Toluene		<0.03	<0.2
Xylene	94	<0.03	<0.2
Aliphatic hydrocarbons	108	<0.03	<0.2