

Welding Technology for Good Milling Practice

Module 1: Safety and Health in Welding Environment

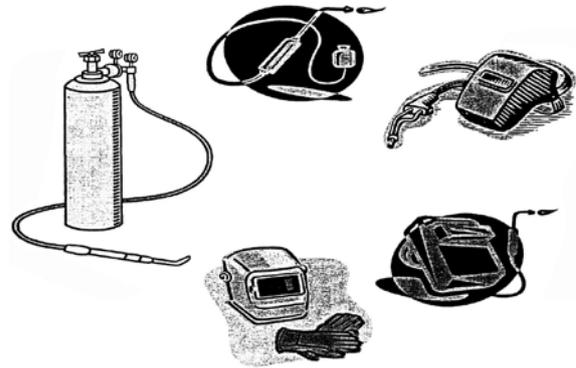
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It is invariably a fact that one opens their eyes only when an accident or mishap takes place. Often people hurt themselves and even lose their lives in accidents. Then only will people start investigating why the accident took place.

It has been found from such investigations that accidents could have been avoided if the people concerned followed discipline in safety precautions.

The most commonly encountered occupational hazards in welding are:

- electric shock;
- electromagnetic radiation;



In Malaysia, death seems to be an occupational hazards costing us dearly especially in construction and manufacturing industries.

**EVERY YEAR MANY KISS THEIR LOVE ONES GOODBYE....
CLIMB INTO THEIR CAR, AHEAD OFF TO WORK ... AND
NEVER COME HOME AGAIN**

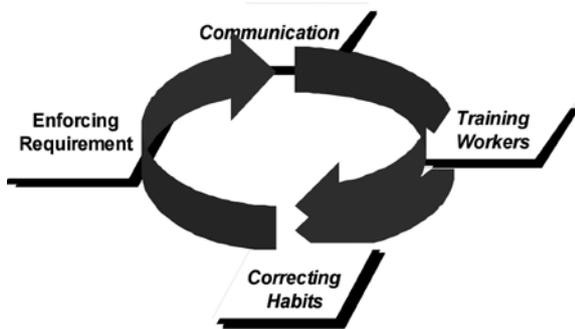


**MAKE HEALTH
AND SAFETY
OUR PRIORITY!!**

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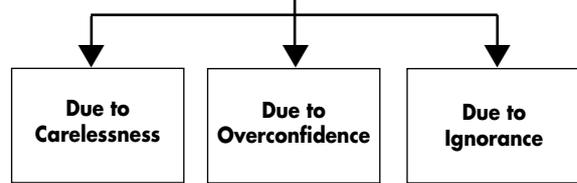
ACCIDENT PREVENTION CYCLE



- burns and mechanical injuries;
- fumes and gases;
- fire and explosions; and
- noise pollution.

Welding is considered a safe occupation because the incidence of occupational illness and diseases among welders is not as high as any other industrial workers.

ACCIDENT

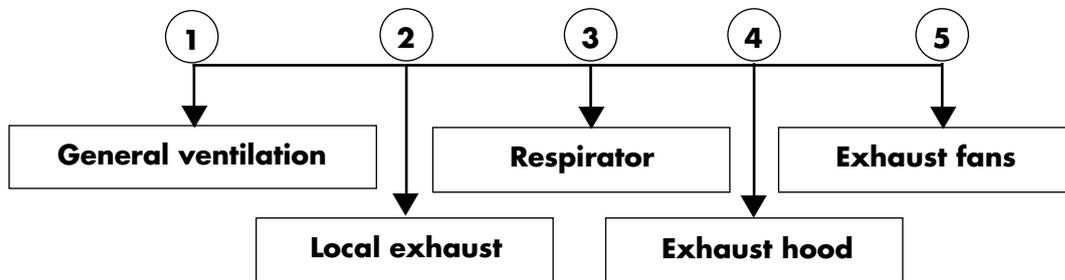


Yet it must be admitted that welders are exposed to potential hygienic hazards associated with welding fumes and gases when they work in ill-ventilated areas over a prolonged period.

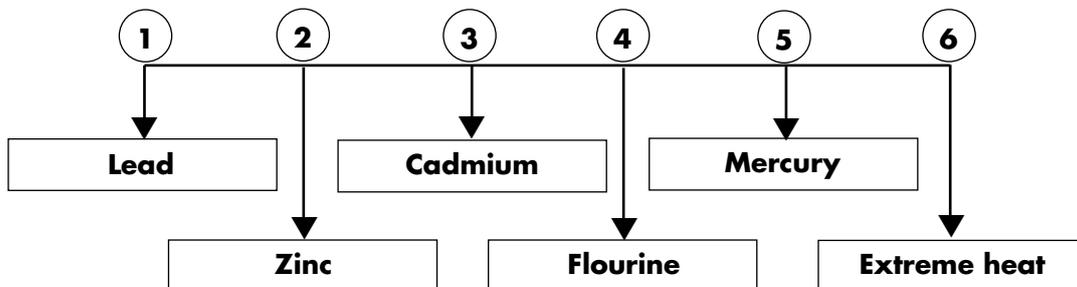
Management must be aware of such hazards and must provide safe and healthy working conditions to their welders.

The management must continuously educate the welders and supervisors on the use of proper ventilation procedures, the use

Health hazards from welding operations may be controlled by:



Health hazards due to gases, fumes or dust:



Repair or replace defective cables immediately.



Keep fire extinguishing equipment at a handy location near the job.



Never watch the arc except through filters of the correct shade.



of safety equipment and observance of safe working practices. The management must ensure their instructions are followed.

Constant inhalation of certain constituents of welding fumes and gases over a period of time can be eventually harmful to lungs and other organs of the body.

The ultimate toxicity of the constituents depends primarily on its concentration and the physiological response of the human body. The constituents of welding fumes and gases are either particulates or gases.

Particulates get deposited in lungs. This condition is termed pneumoconiosis. Pneumoconiosis can be harmless or harmful depending on whether the fume is non-toxic

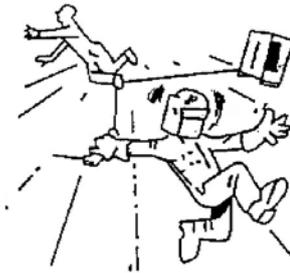
or toxic. The harmful ones can be fibrotic or non-fibrotic.

Examples of Harmful Pneumoconiosis of the Fibrotic Type

Silicon dioxide. Silicosis is caused by the inhalation of finely divided silicon dioxide in the free state, which may be in crystalline form such as quartz. The size of the silica particles is important. It determines the depth to which the particle penetrates into the lungs and in what amount they may be retained there. Silicosis may be either acute or chronic. Most cases are chronic and take years to develop.

Asbestos. Deposition of asbestos in the lung is termed asbestosis. Prolonged inhalation of asbestos fibres between 20 – 50 cm long

Lead and cables should be kept clear of passageways.



Never strike an electrode on any gas cylinder.



Never use oxygen for venting containers.



may lead to a typical pulmonary fibrosis that may be accompanied by severe respiratory disability.

Copper. Inhalation of copper fumes is known to produce fibrosis. In welders, symptoms of metal fume fever can produce congestion of the nasal mucous membrane and other complications. The condition is referred as copperosis. Examples of harmful pneumoconioses of the non-fibrotic type are:

Beryllium. Inhalation of beryllium dust or fume can lead to an acute or chronic systematic disease depending on the extent of exposure and nature of beryllium compound. This is called beryllosis.

PULMONARY IRRITANTS AND TOXIC INHALANTS

- **Cadmium.** Inhalation of cadmium oxide during soldering, brazing or welding of cadmium plate. Effects: respiratory irritation, sore dry throat, cough, chest pain, difficulty in breathing, bronchitis pneumonitis, pulmonary oedema may occur, headache, dizziness, loss of appetite, weight loss. Liver, kidney and bone marrow may be injured by the presence of the metal;
- **Lead.** Inhalation of lead fumes causes lead poisoning, whose symptoms may include abdominal pain, constipation, headache weakness, muscular aches or cramps, loss of appetite, nausea, vomiting, weight loss;
- **Manganese.** The fumes from manganese are highly toxic and they can produce total disablement even after exposures as short as few months to high fume concentrations. Disablement is more likely after prolonged and repeated exposures above 30 m g^{-3} . Such exposure is usually caused by inhalation of manganese dioxide dust;
- **Chromium.** Welding of certain chromium alloys can produce chromium trioxide fume that often referred as chromic acid. Contact with this fume will produce, bronchospasm oedema and hyper secretion, bronchitis hyper reaction of the branches bronchial tree similar to asthma;
- **Mercury.** Welding of metal coated with protective materials containing mercury compounds will produce mercury vapours. Exposure to this vapour may produce abdominal pain, vomiting, diarrhoea, renal (kidney) damage and respiratory failure;
- **Nickel.** Nickel and compound are known to be toxic and induce cancer of the lungs and sinuses;
- **Vanadium.** When vanadium oxide is present in welding wire, the welder is exposed to vanadium pentoxide that is moderately hazardous. Effects of exposure are severe irritation of eyes, throat and respiratory tract resulting in conjunctivitis, nasal catarrh and irritation of throat; and
- **Zinc.** Zinc oxide fumes are formed during the welding, brazing or cutting of galvanized materials. These may cause fume fever such as nausea vomiting, muscular pain, dryness of throat, headache, fatigue and weakness.

EFFECT OF TOXIC GASES

Prolonged exposure to the various toxic gases generated during welding can produce one or more of the following effects:

- inflammation of the lung;
- pulmonary oedema (swelling and accumulation of fluids);
- emphysema (loss of elasticity of the lungs);
- chronic (bronchitis); and
- sphyxiation.





Common Toxic Gases with Welding

- Carbon monoxide;
- Nitrogen dioxide; and
- Phosphine.

Carbon dioxide. Carbon dioxide is harmless but long exposure to high concentration of this gas can produce serious effects.

Ozone. Ozone is formed by electrical arc and corona discharge in air by ultraviolet photochemical reactions. The inhalation of 1 to 2 ppm of ozone for 2 hr produce headache pain in the chest and dryness of upper respiratory track. Welders who have severe acute exposure at an estimated 9 ppm of ozone plus other air pollutants develop pulmonary oedema (presence of fluid in lungs).

Nitrogen dioxide. Very irritating to the eyes and mucous membranes. Exposure to high concentration may produce immediate coughing and chest pain.

Phosphine. High concentration is irritating to eyes, nose and skin. Acute effects of phosphine can be serious and they include serious damage to kidneys and other organs.

THRESHOLD LIMIT VALUES

Factory Inspectorate and Health in Advanced Countries Issue the Following Recommendation

The threshold limit values (TLV) refers to airborne concentrations of substances and represent conditions under which all workers may be repeatedly exposed, day after day without adverse effect. When the TLV of a constituent is exceeded, it presents health hazard to the welder. The TLV of particulate fumes are expressed in m g^3 and gases in parts per million (ppm). The smaller the numerical value of the TLV the more toxic is the constituent.