CASE STUDY 4

Background

A worker received a fatal electric shock while carrying out a.c. arc welding work on a metal structure in a factory.

Cause of the accident

The welder used an alternating current (a.c.) arc welding set. Investigation showed that:

a. the welding electrode holder was not fully insulated;
b. the insulation on the handle of the welding electrode holder was damaged;
c. the voltage measured between the exposed metallic parts of the welding electrode holder and the metal structure where the welding work was carried out was 70 volts; and
d. there was no low voltage shock preventor incorporated in the welding set.

Results of studies given in the International Electrotechnical Commission (IEC) Report Publication 479 shows that an adult person coming into contact with 70 volts a.c. would have a current of between 35 mA (milli-ampere) and 70 mA passing through his body and he would be exposed to risk of ventricular fibrillation; the higher the current, the higher the risk.
How this accident could have been prevented?

- Direct current (d.c.) welding set should be used as far as practicable for all welding works. D.C. welding set operates at 60 V d.c., which is far below the safe (touch) voltage of 120 V d.c.

- Statistics show that the incorporation of a low voltage shock preventor in an a.c. welding set does not totally eliminate the risk of electrical shock. The main reason is that the reduction of open circuit secondary voltage of an arc welding set may takes about 2 to 3 seconds before it reduced to a safe level. During this transition period, any direct contact to the live electrode might still cause electric shock or electrocution.

- All welding sets and the associated tools and accessories should be properly maintained and checked regularly to ensure that they are safe for use.

- When the use of a.c. welding set is inevitable for special welding work, the following safety procedures should be observed:
  (i) Every a.c. welding set should be equipped with an effective low voltage shock preventor (LVSP). The LVSP should effectively reduce the open circuit secondary voltage to a safe level not exceeding 25 volts;
  (ii) The LVSP should be of the built-in type. The workpiece should be connected to the return terminal of the welding set through a proper return conductor;
  (iii) The LVSP should be inspected and tested by a competent person once every six months; and
  (iv) Every welding work involving a.c. welding set should be carried out under the direct supervision of a supervisor, as far as practicable. The supervisor and welder should ensure that all safety precautions are observed at all times.