control More information on this subject is presented in the previous chapter

Personal protective equipment

When it is not feasible to render the environment completely safe, it may be necessary to protect the worker from the environment Personal protective equipment is normally considered to be secondary to the controls mentioned previously Where it is not possible to enclose or isolate the process *or equipment, provide ventilation, or* other control measures, where there are short exposures to hazardous concentrations of contaminants, where unavoidable spills may occur—personal protective equipment should be provided and used

Personal protective devices have one serious drawback—they do nothing to reduce or eliminate the hazard Their failure means immediate exposure to the hazard, so the fact that a protective device may become ineffective without the knowledge of the wearer is particularly serious Excellent equipment that follows accepted standards and specifications is commercially available in great variety All such equipment, however, is intended for *emergency or temporary* use only

Only a brief outline of the types of personal protective equipment is given in this section, because Chapter 19, "Personal Protective Equipment," give a complete discussion of each type

Eye and face protection includes goggles, face shields, and similar items used to protect against corrosive solids, liquids and vapors, and foreign bodies Shaded lenses are used to screen out ultraviolet and infrared radiations Of the many types of eye and face protection available, there is a correct type for each job and it should be worn at all times on that job

Ear protection. Protection against noise-induced hearing impairment, either as ear plugs or muffs, may often present special difficulties First, as with air contaminants, the real answer is to reduce the noise exposure But in plants with old machines and processes, and even in new plants, this problem may loom as insoluble It may be overwhelmingly costly to lower the noise In some cases, it may be required to make wearing of ear protection mandatory

Protective clothing—gloves, aprons, boots, coveralls, and other items made of impervious materials—should be worn to control or eliminate prolonged or repeated contact with dermatitis-producing solvents or chemicals that may cause systemic poisoning through skin absorption Again, care must be taken in choosing the correct article for the specific application For example, some types of rubber that will withstand trichloroethylene will become spongy and disintegrate in lacquer solvent

For intermittent protection against radiant heat, reflective aluminized clothing can be used Such garments need special care to preserve their essential shiny surface Air-cooled jackets and suits are available to make endurable a high convective heat load Lead-bearing materials are available to protect against ionizing radiation

Respiratory protective devices are normally restricted to intermittent exposures or those that are impractical to control by other methods Respiratory protection should not be substituted for engineering control methods Exceptions are supplied-air devices for protection in sand-blasting or for operations in confined spaces where an oxygen deficiency may exist

There are two types of respiratory protective devices (a) air purifiers, which remove the contaminant from the air by filtering or chemical absorption before inhalation, and (*b*) air suppliers, which provide clean air from an outside source or oxygen from a tank Full details of approved types should be obtained from the manufacturer

Filter respirators cover the mouth and nose but do not protect the eyes For dust protection, choose a respirator that meets the requirements for high filtering efficiency and low resistance to breathing A smaller number of respirators have been approved for protection against metal fumes and mists See discussion in Chapter 19

Air line respirators are usually preferable to chemical cartridge or mechanical filter respirators, because they are cooler, offer more positive protection, and offer no re-