Radiation in the Workplace

You are probably familiar with a few uses of radiation, like x-rays and nuclear power. But did you know there are lots of ways radiation is used in the workplace? Radiation is used to sterilize health products, to treat cancer and other diseases, to measure the moisture content of soil at construction sites, to locate leaks in pipelines and defects in welds, to make fluorescent bulbs last longer, to make lightning rods work better--the list goes on and on. Radiation is a tool that is used for great benefit to our society. But radiation can be harmful if it isn't controlled. Do you know the hazards of radiation and how to protect against them

Many people think radiation is some type of chemical or gas. It isn't. Although some chemicals or gases may be "radioactive"--they emit radiation--radiation itself is simply energy. There are many types of radiation. Some types of energy can be seen or felt, such as visible light and infrared radiation. Some types cannot be detected without special equipment. The type of radiation we will discuss is known as "ionizing" radiation. Ionizing radiation cannot be seen or felt. It must be detected with special equipment. Ionizing radiation, unlike infrared, microwave, lasers, and most ultraviolet radiation, is energetic enough to remove electrons from their orbit about the nucleus of an atom. Ionization changes the atom. If the atom is part of a living cell, those changes could cause a health effect.

You are probably familiar with x-ray radiation. X-rays pass through objects and expose film. Dense areas absorb the x-rays so they appear lighter on film than non-dense areas which allow the radiation to pass through. This is why x-ray radiation is useful in many applications, from medicine to security to radiography of welds and other critical structures. X-rays are ionizing radiation. Gamma radiation is similar to x-ray radiation. The other types of ionizing radiation are actually small, energetic particles known as alpha and beta particles. Another type of particle radiation is the neutron. All these types of radiation can cause change to the body's cells.

In order for radiation to affect the body, a person must be exposed to it. Radiation exposure may occur from radiation sources located outside the body, known as "external exposure," or it may occur from sources of radiation located inside the body, known as "internal exposure." Internal exposure results from the inhalation, ingestion, or other uptake of radioactive material by the body. Radioactive material is material which emits radiation, such as radioactive uranium, radium, cobalt, and thorium.

Health effects of radiation exposure have been studied for years. It is very clear that at high levels of exposure, serious health effects occur. These health effects are destruction of bone marrow, incapacitation of the digestive and nervous systems, birth defects in children born to exposed mothers, and increased incidence of cancer in exposed populations. A localized exposure could result in the loss of a hand or foot. These effects are clearly evident at high exposures such as those produced by an atomic bomb detonation or serious accident involving radioactive materials. However, these exposures are much, much larger than those encountered in the workplace. In fact, the health effects

of low exposures, such as those received in the workplace, aren't as obvious as those from high exposures. They're really not obvious at all.

Radiation exposure at the occupational level does not cause obvious bone marrow damage or digestive or nervous system effects. It has not been shown to cause cancer or birth defects. Localized low exposures to the hands and feet, and arms and legs do not cause obvious harm. To be on the safe side, information from persons exposed to high levels of radiation has been used to predict possible health effects to persons exposed to low levels. Since high exposures cause a significant increase in the incidence of cancer, low-level exposure may cause a small increase in the risk of cancer. To minimize this risk, occupational radiation exposures are limited to very low levels.

Companies and other institutions that use radiation are regulated by the Nuclear Regulatory Commission, the Department of Energy, or their state radiological control agency. Persons who work with radiation must be trained in radiation risks and radiation safety practices. They are taught to minimize their exposure by using these techniques:

Time--Decrease the amount of time spent near a radiation source.

Distance--Increase distance between yourself and a radiation source.

Shielding--Use appropriate shielding to reduce radiation exposure.

Depending on the type of radiation used, other specific safety rules apply. For example, persons who work with radiography sources must wear an alarming radiation measurement device to warn them when the radiation level exceeds a certain level. They must also never, ever assume the radiation source is shielded without checking it with a radiation detector--at a safe distance from the source. Some of the highest accidental radiation exposures (well in excess of regulatory limits) have occurred in the radiography industry. These accidents have caused serious local injuries and have even been fatal.

Persons with a potential for internal exposure are also taught to use respirators or other protective equipment to minimize their uptake of radioactive material. Some other techniques for minimizing potential internal exposure are:

No eating, drinking, smoking, or cosmetic application in areas where radioactive materials are used.

Check the work area frequently for "contamination"--radioactive material which has spilled into the work area--and clean it up immediately.

Use gloves, respirators, and other protective equipment as required. Use it consistently and don't take shortcuts.