

## IONIZING RADIATION

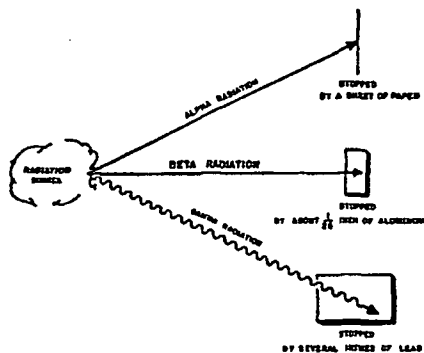


Fig. 42-1. The penetrating power of alpha, beta, and gamma radiation.

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in which the safety of such operations can be evaluated

To the safety engineer who wants a master check list of the items which he must consider, information on current standards of radiation safety performance, and a guide to help him tailor his own efforts or get technical help to fit his specific problems, this chapter is directed

Radiation safety is part of a company's total safety program and is intimately related to other phases of that program. Plant modification may call for the introduction of radiation devices and radioactive materials require radiation safety reviews as well as engineering studies. Traffic patterns for pedestrians and moving equipment may need to be altered to prevent or control the spread of radioactive material throughout the plant.

To place radiation hazards in their proper perspective, radiation work is best introduced to supervisors and employees by the safety engineer who knows the particular plant activities and the company's mode of operation. The accident experience and basic safety problems of an organization will be identical both before and after the introduction of even extensive work with radiation. Frequency and severity rates will rise or fall predominantly from the conventional accidents and injuries. However, the

control of chronic radiation exposures of personnel lends itself to effective accident prevention techniques, and many radiation hazards can be handled with common safety measures. These are some of the reasons for the safety engineer to assume the initiative in making plans to handle radiation problems in the plant.

Review and discussion by the safety engineer and supervisors of material in this chapter should point up difficulties which supervisors and employees may encounter in working safely with radiation, and should point out what management must provide in plant facilities and in items of extraordinary expense. It should enable the safety engineer to integrate radiation safety into his present overall safety effort and to see where his program needs additional emphasis.

This chapter provides the safety engineer with yardsticks to measure the intensity of his problem and to help him determine when he will need technical advice for the specific situation being faced.

Several highly complex subjects—the characteristics of radiation, the physics of the interaction of radiation and matter, and the biological effects of radiation—are discussed briefly to provide some necessary basic knowledge. For further study, see the comprehensive reference list at the end of the chapter.

### Characteristics of Ionizing Radiation

Irradiation of materials and living systems may produce changes and damage, yet causes other than exposure to radiation can produce identical or similar effects. It is therefore worthwhile for the safety engineer to become familiar with the nature of various kinds of radiation and the biological effects so that liability will not be unknowingly accepted for related causes and effects on the health of employees.

Five types of ionizing radiation are currently of practical importance in safety work: X-rays, gamma radiation, beta particles, alpha particles, and neutrons. Nonionizing radiations, such as light rays, heat waves, and radio waves, exist. These are not discussed in this chapter, but they are covered in Chapter 39, "Industrial Hygiene." Also see Fig. 42-3.