Functions of a Radiation Safety Staff

A radiation safety staff must be concerned with establishing safe distances, detecting and measuring radiation, making surveys, decontamination, laboratory and other special services, and record-keeping

Establishing safe distance and times

Work involving external sources of radiation is often done where permanent barriers and shielding protect personnel from harmful exposure. But it is possible that certain operations may occasion some exposure of employees. In these cases, all unnecessary subjection to radiation should be avoided, even to the extent of barring personnel, including technicians, from active areas during exposure time, such as during use of X-ray equipment (see Fig 42-16)

Maintaining a safe distance is especially critical for employees who must work near portable sources of radiation or inadequately shielded nonportable sources In such cases, a radiation survey should be made with an appropriate survey meter by a qualified health physicist or technician in order to provide information to establish minimum safe distances that personnel must abide by

A safe distance is the distance nonoperating personnel must maintain from the radiation source in order to receive no more exposure than that specified in the Radiation Protection Guides even if personnel were to remain *at that distance* continually (see previous discussion under "Regulation and Controls"). The distances specified for a given job may not necessarily remain constant if the radiation in use is modified

Hazardous areas indicated by the protection survey must be barricaded or roped off to form a restricted section which must not be entered by nonoperating personnel or bystanders Large signs bearing the standard radiation symbol, and worded in accordance with the Federal Register, should be posted

The intensity of radiation from a point source of a gamma emitter can be calculated approximately from the equation* (good approximation in range 0 5-2 Mev [million electron-volts], fair in range 0 3-3 Mev)

$$I = 5\ 1CE$$

where I = Exposure rate in roentgens/hour at a distance of 1 ft
C = Number of curies of the source
E = Total energy in gamma radiation per disintegration, in Mev

For radionuclides emitting more than one gamma, E is found by adding the energies together weighted by their relative abundance For example, Co-60 with a 5 2 year half-life is found on p. 631 of Seaborg's "Tables of Isotopes" to have 99+ per cent of the gammas total 2 505 Mev (1 1728 + 1 3325) Neglecting the remaining 1 per cent, the exposure rate at one foot is 12 8 roentgens/hour (R/hr). At 10 ft, the exposure rate is 0.128 R/hr. The intensity is known to decrease as the square of the inverse ratio of distances

$$I_2 = I_1\left(\frac{D_1}{D_2}\right)^2$$

where D = Distance at which the exposure rate (or intensity) is measured Subscripts refer to locations 1 and 2
I = Exposure rate (or intensity) in R/hr

This is known as the "inverse square law" It is also used in the form

$$D_2 = D_1\sqrt{\frac{I_1}{I_2}}$$

To find the distance at which the exposure rate is 2 milliroentgens/hour (2 mR/hr), given 200 mR/hr at 1 ft

$$D_2 = 1 \times \sqrt{\frac{200}{2}} = 10 \text{ ft}$$

Another common practice is to reduce the exposure time and thus the exposure From the knowledge of the dose rate in a given location and the maximum dose which is acceptable for the time period under consideration, the acceptable exposure time can

*J. S. Handloser. *Health Physics Instrumentation.* New York City, Pergamon Press, 1959 p 15