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A METHOD FOR OPTIMIZING THE USE OF RESPIRATORY PROTECTION IN RADIATION AREAS

Keywords: OPERATIONAL & MAINTENANCE TECHNIQUES; RESPIRATORS; RESPIRATORY PROTECTION; RADIATION PROTECTION; INTERNAL DOSE; EXTERNAL DOSE; COST-BENEFIT ANALYSIS; ALARA

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Objectives: If decisions on the use of respiratory protection equipment are made solely on the basis of airborne radioactivity levels, total dose equivalent (the sum of external and internal exposures) may not be as low as reasonably achievable (ALARA).

The objective of this work was to develop an optimization methodology for deciding when to use respiratory protection equipment. The method should take into account the reduction in worker efficiency that results from the use of respirators (and the increase in external dose equivalent) as well as the costs associated both with using respirators and not using respirators (surveillance, bioassay, record keeping, etc.). It should also allow a range of values to be used for relative worker efficiency and the assumed cost of the detriment of a person-rem.

Comments: The method indicates that the decision on whether to use respirators should be based on the following:

- If the airborne radionuclide concentration is significant with respect to the external dose rate, respirators should generally be worn in order to minimize total effective dose equivalent. The exception is when the cost of wearing respirators is excessive.
- If the external dose rate is significant with respect to the airborne radionuclide concentration, respirators should generally not be worn so that the total effective dose equivalent is minimized. The exception is when wearing respirators significantly reduces administrative and bioassay costs.
- If it is costly to issue respirators, they should not be worn unless the airborne radionuclide concentration is significant with respect to the external dose rate.
- If it is costly to not issue respirators when a potential for inhalation of radioactive material exists, they should be worn unless the external dose rate is significant with respect to the airborne radionuclide concentration.

Remarks/Potential for dose limitation: Work in airborne radioactivity areas often requires the use of respiratory protection equipment. In many cases, the decision to require respiratory protection is based solely on the actual or potential airborne radioactivity concentration. At nuclear facilities in the United States, it is common practice to issue

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respirators if airborne radioactivity concentrations exceed specified action levels (25% of 10CFR20 Appendix B values) or if surface contamination levels are very high (i.e., potential airborne radioactivity). This practice is based primarily on two factors: (1) current U.S. Nuclear Regulatory Commission regulations discourage significant internal exposures, and (2) the use of respirators greatly reduces the potential for large accidental intakes. However, this ignores two other important factors that relate to the use of respiratory protection equipment – external radiation levels and the costs of using (or not using) respirators.

References: Merwin, S.E. and J.B. Martin, "A Method for Optimizing the Use of Respiratory Protection in Radiation Areas," *Radiation Protection Management*, Vol. 6, pp. 64-71, January/February 1991.

Duration: from: 1990 to: 1991

Funding: N/A

Status: Completed

Last Update: May 6, 1992