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EFFECTS OF RESPIRATORS ON WORKER EFFICIENCY

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Objectives: To determine if respiratory protection issuance will affect worker efficiency and to what degree.

Full face piece air purifying respirators are an effective means of decreasing worker inhalation of airborne radioactive particles in the nuclear power plant environment. However, it has been frequently assumed that respirators slow workers' performance by as much as 25%. Consequently, there is concern that respirator use might actually increase whole body radiation exposure by prolonging the time workers spend in fields of high radiation.

Comments: Twenty nuclear power plant workers were trained to perform two types of standardized tasks. A dexterity test simulated work requiring a light level of exertion. A bolt tightening task requiring 350 ft-lbs of torque was the standardized task selected to simulate work requiring strenuous effort. During both the morning and afternoon of the test day, subjects performed a dexterity test, the bolt torquing task, and a second dexterity test in sequence. Performances were video taped and time coded to quantify the time to complete tasks. Each subject performed all the tests with and without the respirator and the times to complete the standardized tasks were compared. An important feature of the study was that all testing was performed in an environmental chamber with the high ambient temperature and humidity characteristic of plant environment. Wearing respirators had no statistically significant effect on the times required to complete either the dexterity test or the bolt torquing test. With 95% confidence, the mean percentage difference in time to complete a strenuous task with respirator was between 1% faster to 5% slower. Further, workers subjective perceptions correlated poorly with the times recorded on videotape.

Remarks: An important industry objective is to decrease the total body radiation exposure of workers to a level as low as reasonably achievable (ALARA). This study suggests that respirator use does not increase the time workers need to perform certain tasks and therefore, will not significantly increase the radiation exposure time of workers completing tasks in external fields. However, it is important to note that this study was not designed to assess the effects of respirators on worker efficiency during certain tasks. Tasks requiring communication

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between workers, poorly lit work spaces, or cramped working environments should be reviewed on a case by case basis. In 1995 the research effort will investigate the effects of protective clothing (PC) on cardiorespiratory dynamics, i.e., additional physiological (heart and lung) stress from performing work in PCs.

References: 1. Cardarelli, R., "Effects of Respirator Use on Worker Efficiency," Proceedings, EPRI Radiation Field Control and Chemical Decontamination Seminar, Tampa, Florida, November 6, 1995, available from Electric Power Research Institute, EPRI Distribution Center, P.O. Box 23205, Pleasant Hill, CA 94523.

2. "Effect of Respirators on Worker Efficiency," EPRI Report TR-105350s, October 1995.

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