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A WALK-THROUGH HAND AND SHOE MONITOR
FOR BETA-GAMMA CONTAMINATION

B-8

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by

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A WALK-THROUGH HAND AND SHOE MONITOR FOR BETA-GAMMA CONTAMINATION

SUMMARY

A successful walk-through shoe monitor for beta-gamma contamination was developed and reported earlier.⁽¹⁾ An improved model, the Mark II, with advanced circuitry incorporates hand monitoring and more effective shoe monitoring. The Mark II produces audible and visual alarms if β - γ contamination is present on the hands or shoes of personnel walking through the monitor at a normal pace.

DISCUSSION

SHOE CONTAMINATION DETECTORS

The shoe-monitoring system contains 32 Geiger-Mueller tubes mounted beneath an expanded metal platform. The platform is hinged to a horizontal metal frame with a ramp at each end, as shown in Figure 1. Shoe contamination is detected and indicated as personnel walk over the platform.

FIG. 1 WALK-THROUGH HAND AND SHOE MONITOR

The hinged cover is counterbalanced with door checks and springs to permit access to the tubes and the floor area beneath for maintenance and cleaning. Up to one inch of lead can be installed below the G-M tubes to reduce background.

HAND CONTAMINATION DETECTORS

Four G-M tubes covered by expanded metal shields are mounted in the horizontal section of each handrail (Figure 2).

FIG. 2 HANDRAIL TUBE MOUNTS

INTEGRAL COUNT RATE CIRCUIT AND METER

The circuitries of the hand and shoe sections are identical, but the meters and alarms are mounted in separate instrument consoles. A distinctly different alarm sound indicates hand contamination.

Use of an etched count rate circuit board in place of the bottom cover plate of an edge-reading plug-in meter (Figure 3) makes it possible to replace without downtime the integral count rate circuit and indicating meter for each set of tubes.

All circuitry for the Mark II is solid state except the G-M tubes and alarm relays. Figure 4 shows one of the count rate circuits.

FIG. 3 COUNT RATE CIRCUIT BOARD AND METER ASSEMBLY

FIG. 4 COUNT RATE CIRCUIT

MAINTENANCE

Fifteen months of continuous operation revealed no major maintenance problems; however, two transistors failed and there were several automatic reset failures due to incorrectly rated relays.

PERFORMANCE

The monitor provides a simple, well-accepted method of guaranteeing that employees are not grossly β - γ contaminated when they leave a regulated area. It is a valuable supplement to β - γ hand and foot monitors and other instruments used to detect personal contamination. The monitor equals or surpasses the sensitivity of conventional β - γ hand and foot monitors; shoe contamination of 1000 c/m is readily detected. Further, it can detect high levels of contamination on the clothing of the person walking through the monitor.

Typical cases of fission product contamination detected are:

- Two cases of hand contamination that probed 500-600 c/m by Thyac were detected.
- Two cases of contamination were detected after the conventional β - γ hand and foot counter indicated "Check OK".
- One case of contamination on shoe uppers was detected.
- Contamination of 20,000-80,000 c/m was detected in the thigh area of a pair of coveralls.
- A mop probing 40,000 c/m was detected when it was carried about 2 feet above the foot section.
- Contamination of 10,000 c/m (by Thyac) on the forearm of a lab coat was detected by the hand section.

The monitor readily detects radioactive materials being moved along the corridor beside the monitor. A package radiating 10 mr/hr at 1 foot is readily detected about 4 feet from the monitor.

If there is an alarm, the employee goes through the monitor a second time to see if he is contaminated or if the alarm was spurious.

Because this is a G-M tube instrument, the sensitivity is somewhat dependent upon the background at the unit. Background difficulties are observed when several millicuries of Co^{60} are exposed in nearby laboratories. However, this condition also puts conventional β - γ hand and foot monitors in nearby corridors out of service.

CONCLUSION

The Mark II will monitor personnel for gross β - γ contamination as they leave a regulated area. It will monitor shoes at a normal walking pace. Hand monitoring is limited to inner hand surfaces, but it would be most unusual if only the outer hand surfaces were contaminated.

DRAWINGS

Engineering Drawings CAPE-1006 for the Mark II Monitor may be purchased from:

Oak Ridge Reproduction Service
P. O. Box 363
Oak Ridge, Tennessee 37831

REFERENCE

1. Hardison, H. V. A Walk-Through Monitor for Beta-Gamma Shoe Contamination. E. I. du Pont de Nemours & Co., Savannah River Laboratory, Aiken, S. C.. USAEC Report DP-544 (1961).