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UNITED STATES ATOMIC ENERGY COMMISSION

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COVERALL SHIELDING TO BETA RADIATION

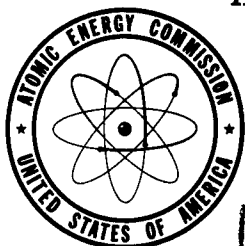
By
Sam A. Rothenberg

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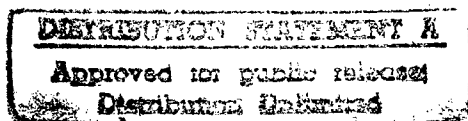
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COVERALL SHIELDING TO BETA RADIATION

(Project RS-2)

by
Sam A. Rothenberg

To determine the shielding afforded against beta radiation from uranium by coveralls worn in uranium processing plants.

The coveralls tested were similar to those commonly worn at all of our uranium plants. They are composed of olive drab denim, winter weight (9 oz/sq. yd.). They are constructed in such a manner as to offer different degrees of shielding for different parts of the garment, since the cloth is hemmed and belted at different points. Therefore, the data for 2 layers of cloth is pertinent.

Conclusions:

The coveralls showed a beta absorption of 11.4% (std. dev. 0.92), for one layer of cloth, and 21.7% (std. dev. 1.16) for two layers.

If the garment is divided into the various loci where exposure to radiation is probable for different operations, we can estimate with fair accuracy, the percent absorption for a particular area. For example, the ankle cuffs are hemmed and give two layers of protection. Some dungarees have cuffs as wide as six inches. This is significant because of high beta rates near the floor in some areas. The table below, will show the overall picture.

Wrists - double cuff - 2 layers

Thigh - 1 layer

Groin to neck - 4 layers - 2 inches wide

Hip and breast - pockets create second layer

Shoulder - 1 layer

Back - 2 inch belt line - 2 layers

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An analysis of the jobs requiring the use of coveralls, should reveal how the men could be better protected, if necessary, by the addition of layers of the same cloth to the areas most subject to radiation.

The shielding by the coveralls was measured with a Fixed Volume Chamber in conjunction with a vibrating reed electrometer. A large sheet of uranium (18" x 24") was used to simulate working conditions at the plant. The cloth was placed over the chamber, while the source was placed at the specified distances from the chamber.

Measurements:

Cloth - Denim - 9 oz/sq. yd.

Instrument - Fixed Volume Chamber - Vibrating Reed Electrometer

Source - Uranium Sheet 18" x 24" 240 mrep/hr.

Distance cm.	No Absorber		1 layer cloth		Percent Absorption	2 layer cloth		Percent Absorption
	Reed	Scale	Reed	Scale		Reed	Scale	
15	.235	x100	.205	x100	12.8	.185	x100	21.0
25	.17	x100	.15	x100	11.8	.13	x100	23.6
50	.73	x10	.65	x10	10.8	.57	x10	21.9
75	.36	x10	.32	x10	11.2	.285	x10	20.8
100	.19	x10	.17	x10	10.5	.15	x10	21.0
Average					11.4 %	21.7 %		
Standard Deviation					0.92	1.16		

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