

INTER-OFFICE MEMORANDUM

DATE

5 September 1945

TO:

G. Kistiakowsky

FROM:

V. Weisskopf, J. Hoffman, P. Abersold and L. Hempelmann

SUBJECT:

Measurement of Blast, Radiation, Heat and Light and Radioactivity at Trinity

VERIFIED UNCLASSIFIED

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Hempelman

I. Blast, Radiation, Heat and Light Measurements

The blast, radiation, light and heat intensities measured at Trinity are recorded in the following tables:

Distance (meters)	Gamma Rays (Roentgens)	Neutrons (thermal) (Neutrons/cm <sup>2</sup> )	Blast p.s.f.	Heat & Light cal/cm <sup>2</sup>
550	35,000	4x10 <sup>9</sup>	26.0	100
700	2,500	1.5x10 <sup>9</sup>	11.0	39.5
1000	600	6x10 <sup>8</sup>	7.2	25.0
1500	100	3x10 <sup>8</sup>	3.5	11.0
2500	10	< 10 <sup>7</sup>	1.6	3.3
10,000	<< 0.1	<< 10 <sup>7</sup>	0.32	0.25

SPECIAL RE-REVIEW  
FINAL DETERMINATION  
UNCLASSIFIED, DATE: 11/20

II. Radioactivity of the ground in the Crater Region.

The radioactivity of the ground in the crater region was extremely high after the explosion. This was the result of two phenomena - one, the mechanical deposition of fission products on the ground (approximately 1-2% of the total fission products) and the other, the induction of radioactivity of certain elements in the soil (chiefly sodium) by the capture of neutrons from the explosion. Twenty-four hours after the test, the gamma radiation from the soil came both from fission products and from radioactive sodium in roughly equal amounts. A complete survey of radiation intensities on the ground was made at plus 24 hours. This indicated that the highest intensity of radiation was in the crater itself. Since the intensity was far beyond the range of our measuring instruments (even with the 50 fold shielding factor provided by the tanks), the highest radiation intensities could only be estimated. The estimates by the tank crew indicated a maximum gamma radiation intensity of approximately 600-700 r per hour. The intensity fell off to about 2.0 r per hour at 725 meters (800 yards). There was no measurement exceeding 0.1 r/hr. (except that which fell from the cloud) outside a roughly circular area around the crater of 1100 meters (1200 yards) radius.

The radioactivity decreased rapidly during the first few days largely due to the decay of 14 hour sodium. Following the initial rapid drop, the rate of decay of radioactive materials became slower following the  $\frac{1}{t}$  law after 2 weeks.

CLASSIFICATION CANCELLED  
PER DOC REVIEW JAN. 1973

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At one week the radiation intensity was about 1/15th of that quoted above. After 30 days, the distribution of the activity had changed in that the highest radiation intensity (15 r per hour) was found at the edge of the crater. The radiation was spotty, being highest over the green glazed patches of earth. The area of significant activity (0.1 r per hour or over) had shrunk to a circular area of 365 meters (400 yards) with irregular pseudopod-like edges.

III. Radioactive materials falling from the cloud in Northeastern New Mexico.

The cloud containing radioactive material produced by the explosion moved toward the northeast at an elevation of 45,000-55,000 feet with a velocity of 14 m.p.h. in the direction of Adobe, Claunch, Encino and Santa Rosa. The radioactive elements which fell from the cloud with dust particles did not reach the ground in significant amounts for the first 10-15 miles of the path of the cloud. Extending northeastwardly there was a swath of fairly high radioactivity on the ground covering an area of about 100 miles long by 30 miles wide. Typical peak intensities due to material on the ground in this region were recorded as follows: 3.9 r/hr at Adobe, 0.11 r/hr at Cedarville, 0.05 r/hr at Encino. One ranch house east of Bingham received an initial radiation intensity calculated to be 7 r/hr. (The persons in this house probably did not receive more than a total of 40-50 r in a two week period, or 60 r in a four week period. After one month the radiation intensities were at about tolerance levels.) Gamma radiation was found in measurable but very low intensities in Santa Fe, Los Vegas, Raton and even in Trinidad, Colorado (260 miles from zero point).

The intensities quoted above are those due to the material lying on the ground. While the cloud was passing overhead these intensities were twice as high; namely at Adobe it was 6.5 r/hr. This was a transient effect lasting about 2 hour until the cloud trail had passed.

The radiation as in the case of that near zero point was emitted both by radioactive sodium and fission products - initially more than one-half of the radiation came from the sodium. The radioactivity decayed rapidly following a  $\frac{1}{1.5}$  law (~~t is measured in hours~~) for two weeks and then, a  $\frac{1}{6}$  law.

Hoffman estimates that about 1-10% of the active material in the cloud was deposited on the ground in the first 24 hours. This is a reduction from the previous estimates of 25% by Hirschfelder and Kules which seemed to us much too high.

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