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Review of Reports Concerning Radiation

Hazards in Event of Catastrophe

20

H. M. Parker

FROM

J. H. Hall

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Review of Reports Concerning Radiation Hazards in Event of
Catastrophe

Classification Cancelled (Change to
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I. CH-474

J. A. Wheeler

Hazard from Gamma Radiation Following Atomic Explosion

Assumptions

1. 250 megawatt pile.
2. All metal thrown out and exposed in finely divided form on level plain.
3. 2 Mev photons liberated.
4. Tolerance dosage at .1 r / 24 hr.

Conclusions

Tolerance distance = 1.9×10^5 cm = 1.2 miles.

By Authority of DEC

May 1943

PM Eick 9-5-92

Verified by
Stowick 3/6/92

INV.
9-47

II. CH-504

A. H. Compton

Hazards from Radiation in Event of Various Failures

A. Helium escape

No danger when coated metal used

B. Coating Failure

Fission products in water but of no danger if water diverted and retained in a reservoir.

C. Coating Failure plus Helium escape

Gamma radiation from helium appreciable only at a few meters

D. Water cooling failure

Assumptions

1. Water flow ceases
2. Temperature rise causes chain reaction to stop
3. Radioactivity produces heat development at 25 megawatts
4. Air present and oxidation of metal begins.
5. Escape of gaseous radioactive by-products into atmosphere with the higher boiling point products, distilling on cooler parts of pile chamber or stack. Results in a slow diffusion with atmosphere. Blown away by wind as a cloud. Cloud immerses a person on ground.
6. Dosage is due to gamma rays from products released.

Conclusions

For a dosage of 25 r (one exposure) safe distance from pile one hour after the accident is

$\approx \frac{1.2 \times 10^5 \text{ cm}}{v}$ where v = velocity of wind in m.p.h.

From above, if $v = 1$ miles per hr. safe distance is 1.2 miles. Conclusion implies that the safe distance is independent of the time required for the radioactive material to escape into the atmosphere, supposing that this time is not long enough for a large reduction in the radioactivity of the gas. (The derivation of the result makes use of a questionable statement, dispersion

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H. M. Parker

Review of Reports Concerning Radiation
Hazards in Event of Catastrophe

September 6, 1944

of a cloud of average radius r should occur when the distance of the cloud from the source $s \approx 7r$. This distance is then assumed to be the safe distance. The theory upon which this statement is founded is not discussed. Investigation of meteorological theory may shed some light upon the point.)

5.4 day 1 e hazard from extraction plant. (Normal operation)

Assumptions:

1. One day's production of $1e \approx 1/30$ of total output of 250 megawatt pile. Dissolved 30 days after shutdown of pile.
2. Tolerance dose $\approx .1 r$ /day. (Continuous exposure).
3. Beta and gamma radiation responsible for dosage.

Conclusions

Safe wind velocity ≈ 1.4 mi/hr.
(Meteorological data give

$v_{eff} \approx 4$ mi/hr.)

Jane H. Hall

Jane H. Hall

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