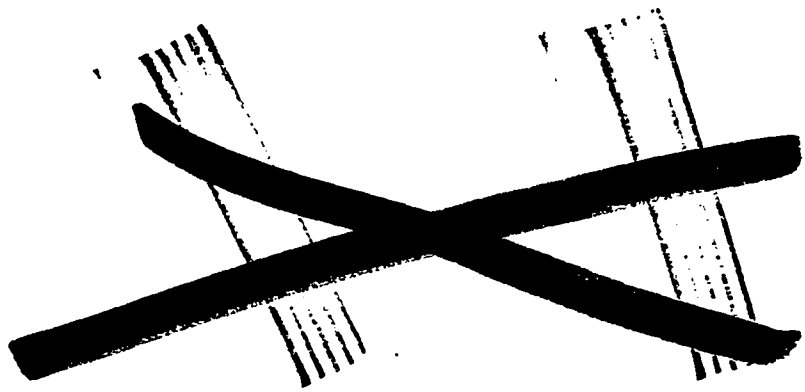

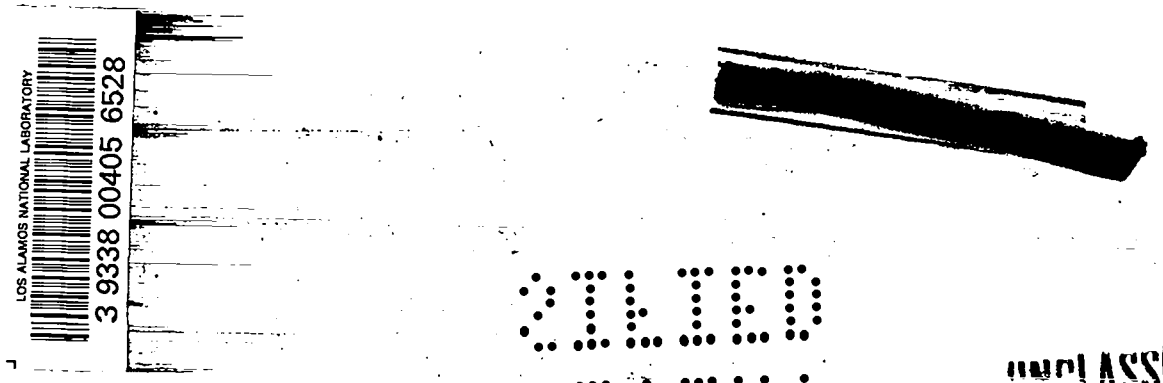

LAMS 453

[redacted]

December 23, 1946

This document contains 5 pages
(5 pages of test)

SAFETY TEST ON THE STORAGE OF PLUTONIUM TETRAFLUORIDE

Work done by:

V. Alexandor Nedzel

John E. Orndoff

James H. Roberts

Report written by:

James H. Roberts

ABSTRACT

Twenty-nine bottles of PuF_4, each containing about 160 grams of plutonium were placed on the floor in a corner of a 4' x 4' x 8' concrete vault at DP Site. The tetrafluoride was in sterling glass bottles, 5-3/8" high and 3-1/8" in diameter, which were placed inside quart-size ice-cream cylindrical cartons. The cartons, $3\frac{1}{8}$" in diameter and 7" high, were placed as close together as possible side by side in an array resembling the quandrant of a circle on the floor in a vault corner opposite the side containing the door. No multiplication was observed.

SAFETY TEST ON THE STORAGE OF PLUTONIUM TETRAFLUORIDE

At the request of Mr. Cromer at DP Site, a test was made on the safety problems involved in the storage of plutonium tetrafluoride in a concrete vault 4' x 4' on the sides and 8' high. The test was carried out in vault 414, Bldg. 4, D. P. West. The walls and ceiling of the vault are 8" thick and the floor 6" thick. A large steel door about 6" thick and about 4' wide and 7' high is one side of the vault.

Two counters, one a bare U-235 fission counter and one a boron-lined proportional counter surrounded by 1½" of paraffin, were used in the measurements. The boron counter was placed outside the door of the vault, and all the counts were made with the door of the vault nearly closed. The fission counter was placed inside the vault rather close to the active material. The amplifiers and scalers for both counters were outside, and the door was open just wide enough to permit the cable from the preamplifier to the amplifier to pass through.

Measurements were first made by putting a table with a wooden top about 1" thick in the vault. The table was about 3' high. Thirty sterling glass bottles were placed inside the cardboard cartons. Each bottle contained SiO_2 powder having the approximate weight of the PuF_4 stored in each of twenty-nine other bottles. The bottles containing the SiO_2 were arranged in a pseudo circular array. The positions were marked and numbered on the table top. Six of these were removed from the center, and six bottles, each containing about 160 gm of

plutonium, in the form of tetrafluoride, were put in their place. A two-minute count was made on both counters. The six bottles of active material were then replaced by the SiO_2, and two bottles of active material were put in the place of two other bottles of SiO_2. A two-minute count was taken. Similar counts were taken with two bottles of the SiO_2 successively replaced with the tetrafluoride; in all but the first arrangement in this sequence of measurements only only two bottles of the tetrafluoride were present at any one time. These measurements were made in order to determine the source strength. Since about 10^6 neutrons/sec are emitted from each 160-gm batch, resulting from the (α, n) reaction in the fluorine, it was not necessary to use an auxiliary neutron source.

After the completion of the above sequence of measurements, the original six bottles of active material were replaced and counted again as before. Then two bottles of active material were added, replacing two bottles of SiO_2, and counted for a two-minute interval. This process was repeated until twenty-seven bottles of the tetrafluoride were present in the array. No multiplication was observed; i.e., the counting rate went up as expected from the addition of source neutrons.

The table was then removed and the experiment repeated by arranging the bottles on the floor in one of the corners opposite the door of the vault. They were placed side by side, closely packed,

to form approximately the quadrant of a circle in the vault corner. This time twenty-nine bottles in the cartons, each bottle containing about 160 gms of plutonium (the total mass was 4,625.0 grams) were thus packed together. Again no multiplication was observed. The measurements were made with the vault door nearly closed.

This experiment clearly indicates that it is safe to put six bottles in each of the eight corners of the vault, as Mr. Cromer proposes doing.

[redacted] [redacted] UNCLASSIFIED

DOCUMENT ROOM

REC. FROM [signature]

DATE 12/27/46

REC. ____ NO. REC. —

[redacted]

[redacted] UNCLASSIFIED

UNCLASSIFIED

APPROVED FOR PUBLIC RELEASE