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February 17, 1950

RECORD CENTER FILE

MEMORANDUM

TO: J. M. Frame

FROM: J. L. Weeks

SUBJECT: RADIATION INTENSITY AT CENTER 42" RISER ON
WASTE STORAGE TANK (MJ-4)

This document consists of
2 Pages No.

The following figures were obtained in the study of this
problem:

Measurements in Chamber Well (7-5537)	Calculated Values			
	No Shield		12" Concrete	
	1½ yr	2 yr	1½ yr	2 yr
25,600 mr/hr	12,000	6,000	50	25

It is recommended that the actual intensity existing
to-day above the liquid be measured before recommendations are
made on cutting through the concrete seal.

A detailed statement of work on this problem follows.
The calculations have been filed.

In the study of the feasibility of cutting through the
concrete seal on the center riser of the waste storage tank
the radiation intensity that would be encountered is critical
because direct operator contact would be required.

The question of the radiation intensity to be expected
was approached from two standpoints: (a) A study of previous
measurements of sludge level and activities in the storage
tanks (7-5537, HEW-7402, HW-7776, HW-10,154, HW-11,235), and
(b) Direct calculation.

(a) Measurements reported in the above documents were
obtained by lowering a special ionization chamber into a 4"
chamber well on the storage tank. In a test on December 5, 1946
in the 241-T area on Tank 101-T an ionization chamber reading
of 25,600 mr/hr was obtained when the chamber was just below
the top of the tank and 7.25 ft. above the surface of the liquid.
This reading is probably quite a bit lower than the actual in-
tensity existing at this point due to the construction of the
chamber.
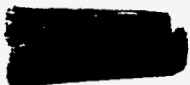
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The chamber was constructed in the form of a cylinder whose overall dimensions were approximately 4" diameter by 6" length. The ends of the cylinder were shielded with approximately 1" of lead. The electrodes were metal discs about 1" diameter and separated by about ¼". They were supported in the center of the cylinder. Thus the chamber was most sensitive to radiation entering at right angles to the axis of the cylinder.

(b) The calculations were based on the following assumptions:

1. Metal was irradiated to 200 MWD/ton.

2. Total metal in tank was 315 tons.

3. Average age was 2 years.

4. Ten percent of activity was contained in supernate.

5. Gamma radiation was due to Cs^{137}, Pr^{144}; Rh^{106} only.

6. Distance from liquid level to receptor was taken as 16 feet.

7. Concrete seal on riser was assumed to be 12" thick.

On the basis of these assumptions the calculated value of the radiation intensity, with no shielding was 6000 mr/hr; and, with 12" of concrete shielding; 25 mr/hr.

The difference between the calculated value of the radiation intensity and the measurements obtained with the ionization chamber indicates that it would be hazardous to make recommendations on the basis of calcualtions based on the simplifying assumptions used. Rigorous analysis of the problem would be time-consuming; if not impossible. Several pertinent questions can not be answered at present. For example, what is the exact distribution in the tank of certain fission products?

It is recommended that a request be made for measurements of the radiation intensity in the air space above the liquid with a chamber that will measure the total radiation.

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