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UNION CARBIDE NUCLEAR COMPANY

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OAK RIDGE, TENNESSEE  
January 29, 1958

U. S. Atomic Energy Commission  
Post Office Box E  
Oak Ridge, Tennessee

Attention: Mr. S. R. Sapirie

Gentlemen:

Subject: Revision of the Ichiban Program, Activity 6600

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Classification Changed to UNCLASSIFIED  
By Authority of CG-DAR-1  
Classification Authority

T. F. Davis, Analysis Corp. 10-5-89  
Date 10-23-89 5429

Analysis of the data obtained at Operation Plumb Bob on the radiation attenuation afforded by Japanese type houses (see attached) indicates that:

1) The part of the Ichiban Program proposal (C. E. Center to S. R. Sapirie, February 13, 1957, page 2, section 2) pertaining to the measurement of radiation attenuation by Japanese houses at ORNL reactors should be revised.

2) A more comprehensive and detailed dosimetry and shielding program should be conducted in a future weapons test, with instruments and techniques more reliable and accurate than any that now exist.

The Laboratory proposes, in lieu of house attenuation measurements at ORNL reactors, a program to evaluate and to compare all existing dosimetry techniques and instruments, and to develop those most suitable for obtaining the necessary data at future weapons tests. Preparations for this study must commence immediately if best results are to be obtained at any test within three years.

This dosimetry evaluation and development program is necessary for accurate and reliable measurements of doses at weapons tests, and in addition is badly needed for such applications as civil defense, radiobiology, and reactor accident monitoring. These applications have certain requirements in common with weapons tests such as small size and cost, long term stability during stand-by disuse, and wide range of response.

As this revision of the Ichiban program involves budget considerations, the revised proposal and cost estimates are outlined as follows:

~~RESTRICTED DATA~~

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Mr. S. R. Sapiric

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January 29, 1958

Previously Spent or Outstanding as of January 1, 1958,  
Including Completion of Plumb Bob Field Study ----- \$ 54,000.00

Cost Estimates for Last 6 Months of FY-1958

1. Dosimetry Liaison with ABCC ----- Dr. E. T. Arakawa to be in Japan for approximately two years. He replaces the rotating pool. One-half man year plus travel expenses.	17,000.00
2. Medical Liaison with ABCC ----- Dr. N. Wald on about three days per month consultantship, plus travel expenses for other authorities.	6,000.00
3. Other Personnel ----- Three physicists to conduct a comprehensive study and evaluation of all field dosimetric systems and techniques (1.5 man years).	37,500.00
4. Theoretical Program ----- To calculate doses, for certain configurations, using the IBM704 about 100 hours, plus 1/4 man year.	7,500.00
5. A Synthetic Neutron Source, Po-Be, 60 Curies ----- For basic attenuation measurements, and for instrument response determinations.	9,200.00
6. Van der Graaff Accelerator Time ----- For evaluation of neutron response of gamma detectors as a function of neutron energy.	1,500.00
7. Miscellaneous Engineering and Modification of Existing Detector System Accessories -----	7,000.00
8. Modification of Building Facilities to Permit the Necessary Experiments -----	1,500.00
9. Special Apparatus for Shielding Studies, Using Radioactive Sources -----	8,800.00
Total Necessary FY-1958 -----	\$ 150,000.00
Present Budget Approved FY-1958 -----	100,000.00
<u>ACTIVITY 6600 ADDITIONAL FUNDS REQUIRED -----</u>	<u>\$ 50,000.00</u>

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Mr. S. R. Sapirie

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January 29, 1958

This proposed revision represents the most efficient and economical approach to the attainment of the objectives of the Inhalation Program, i.e. the procurement of reliable information for relating radiation exposure to biological damage in humans. Further, it will provide other important programs with much needed and improved dosimetry.

The Laboratory urges that the requested additional \$50,000.00 be provided, under Activity 6600, so as to assure best results for the future experimental program.

Yours very truly,

UNION CARBIDE NUCLEAR COMPANY

*Clark E. Center*

Clark E. Center  
Vice President

CEC:JAA:nb

Distribution:

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Attachments (1)

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Abstract of Plumb Bob Data

Program 39.5, Civil Effects Test Group

In the Plumb Bob Weapons Test Series measurements were made of the direction distribution of radiations at various distances from the hypocenter. For gamma rays the physical quantity which was measured was the first collision tissue dose using chemical dosimeters developed by the U. S. Air Force, School of Aviation Medicine; for fast neutrons both the energy distribution and the first collision tissue dose were measured using threshold detectors developed at Oak Ridge National Laboratory. It was found that the distribution for the case of gamma radiation was essentially peaked about the direction defined by the point of detonation and point of measurement. For fast neutrons the angular distribution can be represented by a spherical distribution plus a peak along the previously defined direction. In both cases the angular distribution is rather insensitive to the type of weapon and to distance from ground zero. The data obtained are extremely valuable as input information in the determination of amount of shielding afforded by any type of structure to prompt radiation from weapons.

Measurements were also made of the attenuation coefficients of material similar to that used in Japanese type structures for both neutrons and gamma rays. These data in connection with the angular distribution enable one to calculate the dose inside Japanese type houses.

Measurements were made of the gamma-ray and fast-neutron dose inside two identical Japanese houses at one detonation and at one distance from ground zero. It was found that both the neutron and gamma-ray dose in the house varied by a factor of 2 depending on the exact location of the point within the house. The dose within the house correlated rather well with a very simple parameter—namely, the distance as measured from the point of entry into the house to the point of measurement along the ray path from the burst point. In most cases the spread of individual points from the curve drawn to represent this correlation was less than  $\pm 10\%$ .

In one shot the effect of locating samples on the side of a hill was examined. It was found that for those stations located on the side of a hill the dose was essentially the same as for those stations located on the level terrain at the same slant range from the burst point. Thus the application of dose quantities measured in Nevada can be applied to the Nagasaki case disregarding the effect of terrain, except for those cases where the house is directly shielded by the hill. In these cases the angular distribution data could be used to estimate the dose.

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