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UNION CARBIDE NUCLEAR COMPANY

A DIVISION OF UNION CARBIDE AND CARBON CORPORATION

UCC

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POST OFFICE BOX P  
OAK RIDGE, TENNESSEE

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February 13, 1957

U. S. Atomic Energy Commission  
Post Office Box E  
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Attention: Mr. S. R. Sapirie

Gentlemen:

Subject: The Ichiban Dosimetry Program  
(Formerly referred to as the Japanese Dosimetry Program)

The Oak Ridge National Laboratory's interest in determining the dose received by the Japanese during the Hiroshima and Nagasaki bombings was described in our letter of March 20, 1956. Our letter of May 31, 1956 described what we believed at that time to be the first step in determining this dose. This step of the program is progressing well, and we are confident that we will be able, as a result of Operation Plumb Bob, to determine the angular distribution of radiation as a function of distance from atomic weapons.

The purpose of this letter is to describe more fully the long-range interest of the Laboratory in this dosimetry effort. We propose that the Laboratory embark on a long-range program to obtain the necessary information on dose inside Japanese houses.

The basic nature of the proposed program will permit application not only in determining the dose received by the Japanese but also in understanding structural shielding in AEC Civil Effects, Military Applications, and many other phases of AEC operations. In order to evaluate the doses in question, it is necessary to obtain information as follows: (1) the yield and radiation characteristics of weapons identical to those used in Japan; (2) the attenuation in air of the radiation from these weapons in its passage to the structures in which individuals were located; (3) the attenuation of radiation in structural materials; and (4) the synthesis of this information to obtain a dose value for particular irradiated individuals. This requires a compilation of data on configuration and composition of shielding so that structural attenuation may be assessed for the cases of interest.

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I.D. Prod*

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Classification changed to UNCLASSIFIED  
By Authority of CE-OAR-1  
Classification Authority

T. F. Davis, Analysis Corp. / 0-5-57  
Date

*T. Anderson 11-23-59*

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Mr. S. R. Sapirie

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Because of practical considerations such as availability of materials, weapons test schedules, etc., the program will be carried out in the following order:

(1) Angular Distribution Determination. In the Plumb Bob weapons test series (1957) measurements will be made of the distribution of radiations in direction at points located at various distances from the detonations. The measurements will be made using threshold detector techniques developed at ORNL for neutron measurement and the chemical dosimetry methods developed at the School of Aviation Medicine, USAF, for gamma measurements.

The purpose of the angular distribution measurement is to obtain enough information about the characteristics of radiation arriving at a point in air so that its attenuation and scattering by structures around the point in question may be evaluated. The basic data obtained in this manner tells one the attenuation from the point of bomb detonation to the outside of the structure and enables one to take the next step, viz., that of determining the attenuation and scattering by the structure. Participation in shots at the 1957 test series will be arranged so that angular distributions can be measured using weapons which simulate those used in Japan as closely as is practical. The attenuation of a few Japanese type houses will be tested in this test series.

(Time schedule for step 1: 2-1-57 to 10-1-57)

(2) Measurement at ORNL of House Attenuation and Scattering. This step consists of the determination of attenuation and scattering of houses by irradiating suitable mock-up houses with gamma rays and neutrons. The radiation source will consist of the TSF reactor arranged in such a way that it can reproduce the angular distributions measured in step (1).

(Time schedule for step 2: 10-1-57 to 7-1-58)

(3) Measurements of the Dose in Air Due to Duplicates of the Hiroshima and Nagasaki Weapons. The detonation of duplicates of the weapons used in Japan should be accomplished in the 1959 series. Measurements of the dose in air at various distances should be carried out along with measurements inside several Japanese houses. The air measurements will allow one to normalize the dose to the correct value and also to determine to what extent the spectral characteristics of the weapons used in Japan differ from those tested in the 1957 series. The measurements inside the houses will enable one to test in detail various models for the calculation of house attenuation and scattering.

(Time schedule for step 3: 7-1-58 to 7-1-59)

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(4) Application of Physical Information to ABCC Records. The separate consideration and calculation of each significant exposure case in the ABCC records may be carried out, after completion of the bulk of the work described above, by a relatively modest computational effort. In order that the computations shall be accurate it is necessary that the information on location of each case and the shielding configuration involved shall be complete and accurate. The shielding program at ABCC should be expanded to obtain the amount and kind of information needed for a proper dose evaluation. It is obvious that a close liaison should be established immediately between ORNL and ABCC in order that the goal of the Ichiban program can be attained.

I would like to emphasize the urgency of getting step 4 underway immediately. In order to do this we are proposing to set up a liaison pool which will coordinate dosimetry efforts at ORNL with the shielding program of the ABCC. The detailed justification and mode of operation of this pool are enclosed.

In order to carry out this program during the next two fiscal years, our budget requirements will be as described in the enclosures.

Yours very truly,

UNION CARBIDE NUCLEAR COMPANY

Clark E. Center  
Vice President

CEC:GSH:dk

cc: R. A. Charpie  
G. S. Hurst  
K. Z. Morgan (2)  
L. P. Riordan  
Hezz Stringfield  
J. A. Swartout (2)

Attachments (3)

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Attachment 1

THE ICHIBAN DOSIMETRY PROGRAM

Functions of the Liaison Pool

The function of the liaison pool will be to (1) gather information from the ABCC for use by the Ichiban group; (2) keep the ABCC informed of the progress and results of the Ichiban group; and (3) advise and recommend to the ABCC any changes of methods or additional data which may improve the project. The responsibilities of liaison personnel will be as follows:

- A. Review ABCC records
  1. Obtain data on buildings and shielding
  2. Determine location and fate of individuals in buildings
  3. Obtain medical facts which may be correlated with absorbed dose
  4. Recommend expansion of the scope of the ABCC Shielding Survey Program when this appears desirable
  
- B. Collect data on bomb burst
  1. Burst height (with error)
  2. Location of ground zero (with error)
  3. Weather conditions at time of burst
    - (a) Temperature
    - (b) Humidity
    - (c) Atmospheric pollution
    - (d) Barometric pressure
  
- C. Initiate three dimensional pictures
  1. By use of aerial stereophotographs and other means, to establish how much, if any, multiple shielding of one house by another may have reduced the quantity of radiation absorbed by individuals located indoors.
  
- D. Perform physical measurements on existing houses
  1. Determine average values with standard deviations of the following quantities:
    - (a) Density of roof material
    - (b) Thickness of roof material
    - (c) Density of wall material
    - (d) Thickness of wall material
    - (e) Mass absorption coefficient of wall material
    - (f) Mass absorption coefficient of roof material

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## Attachment 2

## THE ICHIBAN DOSIMETRY PROGRAM

Budget for Fiscal Year 1958

I.	<u>Plumb Bob Cleanup</u> -----	\$ 25,000.00 (CEIG)
II.	<u>ABCC Records</u>	
	1 man year + reproduction -----	45,000.00 (draftsman-engineer) (1 man year)
III.	<u>Laboratory and Shielding Measurements</u>	
	(a) TSF Facility -----	\$ 210,000.00 (incl. 7 m/y)
	(b) Three experimental physicists ----	84,000.00 (3 m/y)
	(c) Instrumentation -----	50,000.00
	(d) House building program -----	50,000.00
	(e) Other shielding configurations ---	50,000.00
		<hr/> 444,000.00
IV.	<u>Theoretical Program</u>	
	(a) Oracle time (100 hours) -----	10,000.00
	(b) One mathematician -----	25,000.00
		<hr/> 35,000.00
V.	<u>ABCC Pool</u>	
	Travel -----	10,000.00
		<hr/> 559,000.00
		TOTAL

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THE ICHIBAN DOSIMETRY PROGRAM

Budget for Fiscal Year 1959

I.	TSF Facility -----	\$ 210,000.00
II.	Nevada - 1959 -----	500,000.00
	(a) Threshold detectors	
	(b) Chemical dosimetry	
	(c) Air dose	
	(d) House attenuation	
	(e) Gamma spectrum	
III.	Six experimental physicists -----	180,000.00
IV.	Shielding structures at ORNL -----	100,000.00
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		990,000.00