STANDARD FORM NO. 64

Office Memorandum • UNITED STATES GOVERNMENT

TO : Dr. Shields Warren, Director, Division of Biology and Medicine

DATE: 25 June 1949

FROM : Dr. George V. LeRoy

SUBJECT: Justification for installations recommended for the performance of biologic tests at Eniwetok .

1. Capt. R. H. Draeger (MC) USN and I reviewed the entire program critically in the course of the preparation of detailed specifications for the construction requirements for the Animal Breeding Colony. In the course of this review several deviations from the original tentative plan were made. The present requirement, while not final, probably represents the maximum requirement.

2. This series of justifications, and a number of drawings, and material procurement lists, on which Captain Draeger is working, have been prepared as a result of our recent conference with Dr. Graves, Miller, Clark, Burris and Preuss, on 23 June 1949, at the AEC. At this conference Dr. Graves indicated that a biologic test program was to be included in the weapons test program, and that the proposals carried out to him By Dr. Wright Langham, were generally acceptable - subject to review by the J-Division advisory group. At this conference it was agreed that all the construction on Japtan should be done by the AEC contractor. It was therefore requested that a building conference be held June 30, 1949 at Los Alamos, attended by the representatives of the contractor. At this time, it was asked that we be prepared to submit a detailed proposed layout for the buildings on the island; preliminary plans for the arrangement of the buildings, utilities, animal runs, etc. It seemed desirable therefore to prepare not only the plans, but also a statement of the justification for the requirements.

3. The animal housing requirements is based on the use of animals during two test shots. This planning is justified by the recommendation of the Radiologic Defense Panel of the NSRB who recommended that no opportunity should ever be lost to conduct biological studies when atomic weapons are tested.

4. Copies of the layouts, building plans, and tentative procurement schedules will be submitted when completed by the staff of NMRI.

5. A statement of the available shipping for the movement of the breeding stocks and personnel to Eniwetok will be obtained by Captain Draeger from CNO, and will serve as a basis for the timing of the construction at Eniwetok.

Respectfully submitted.

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MEDICINE, HEALTH & SAFETY Bikini

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

1. Mouse requirements:

A. Number of animals requested or suggested in the original approved proposals:

Project No	Proposer	Number of Mice
(1) 2,7	NMRI,NIH,ROCH	6,000
(2) 2,7	NMRI, ARG	1,000
(3) 2	UCal	2,500
(4) 8	LA	1,100
(5) 4	NMRI	400
1st Test :	Total (round numbers)	11,000
2nd Test :	Estimated, minimum	4,000
	Grand Total, 2 tests	15,000

B. Justification:

(1) 6000 mice: 200 mice would be placed at each exposure station - 100 males, 100 females, for LD_{50}, lethality, survival studies. This number of mice is recommended by Dr. Lorenze, NIH, and by Dr. Cronkite, NMRI. With such numbers the standard error of results in this type of experiment is approximately 2.0 %, or less.

The plans call for the use of 2 lines of 10 exposure stations, each, in the water; and 1 line of 10 stations on land. These stations would be located so that the first 3 would be certainly inside the lethal range; 3 would be where LD_{50} could be anticipated - 600 - 700 r range; and 4 would be in the sublethal zone, at approximately 400, 200, 100 and 50 r.

(2) Brues plans to build 2 - 3 shields with collimating slits; each shield would require 50-100 mice at each point in the shield, and approximately 3 are feasible.

(3) 2500 mice: 500 of these would be used for FP studies; the balance for a study of the protective action of drugs; at the LD_{50} range. At least 3 stations would be required; and 3 dose levels at each station (of drug), using 200 mice for each test group.

(4) 1100 mice: In this study 30 mice would be required at each point as biological monitors in the 20-600 r range. 15 land stations, 10 stations inside shields, and 10 stations in drones is a reasonable estimate of the requirement.

(5) 400 mice: for blast studies.

The estimate for a second test is a pure guess.

1126

2. Mouse Housing: The plan requires that 11,000 mice of ages 7 - 12 weeks be on hand at the time of the test. To accomplish this the colony on that date would contain approximately 15,000 mice, older and younger. Many more would have been killed along the way after being used for calibration,

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become saturated with urine and feces and food debris which would attract flies and would be a definite health hazard. Paving, or suitable stabilization of the coral would permit the washing water to run off into the soakage pits, and would eliminate all these undesirable features. The soakage pits are of a design that has been used in military field operations, and should be satisfactory.

The dimensions of the runways, shelter houses, breeding, pens, fence height, etc., have been supplied by a qualified veterinary officer of the USA Medical Department.

8. Dog food: the basis of the requirement is 1 lb/dog/day; 1/3 of which should be meat. If canned horsemeat is provided, it will not be necessary to have one of the walkin reefers which had been planned to store frozen horsemeat.

9. Dog water: the basis of the requirement is 1 gal/dog/day, as recommended by the veterinarian. If the automatic watering devices (see below) are used, waste will be minimal and the figure cited should be correct; if they are not used it would be necessary to double the daily ration to allow for water-waste and spillage.

10. Pig requirements:

A. Pigs are to be used in two types of experiment: a) study of thermal injury; and b) serial sacrifice study to obtain blood, plasma and tissue for study, and for comparison with Bikini and laboratory experimental data. The requirement is 200 pigs per bomb test, or 400 if they are used two times.

B. For the thermal injury study, the requirement is as follows:
Project 3, ARG, 20 pigs per test
" 3 ROCH, 30 pigs per test
Engineer study, 30 pigs per test.
For the burn study, the pigs would be exposed on land, at distances varying from 1000m to 3000m, in shields designed to reduce or eliminate the total body ionizing radiation, by the use of portholes, mirrors, or time-operated shields. The group designated for engineer studies are to be placed in buildings under test, for various type of injury-study, if such buildings are used.

C. For the study of ionizing radiation effect, the pigs will be exposed in tanks, using 120 pigs per test, 2 per tank. The material collected would be of the same sort, and for the same people, as in the dog studies. The location of the tanks, is tentatively, as follows: 12 at 300m; 12 at 600 m; 18 at 800 m; and 18 at 1200 m. 24 animals recovered from each station will be sacrificed serially, one per hour for 24 hours. The additional 12 pigs in the two outer (distant(stations) would be

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s acrificed at the rate of 4 per day for 6 days.

D. The total pig requirement for one test is thus 120 + 50 + 20 equals 190 pigs, or to be safe, 200 pigs; and for the two tests is 400. If no engineer structures are to be used for exposure of pigs, 20 per test can be subtracted.

11. For the recovery of ~~the~~ all the animals exposed in tanks in the lagoon, it is planned to use tank-lighters or M-boats, equipped with a suitable hoist to get the tanks aboard. The animals to be autopsied in the first and second hour after exposure would be picked up by craft carrying pathologists who would perform the autopsy at once, in the boat, and suitable arrangements for refrigerating and preserving the tissues would be carried. All the other tanks could be returned to Japtan, and the animals placed in the runways until the time for serial sacrifice. It is estimated that 6 - 8 M boats would be sufficient to recover the material promptly.

12. Pig housing: The recommendation to pave the runways is as desirable in the case of the pigs as with the dog housing. The dimenstions of the runs, the height of the fencing, etc., have been provided by a trained veterinarian.

13. Pig feed: is based on a requirement of 3½ lbs/pig/day; using two sorts of feed: growing and fattening diet, and gestation diet. The automatic pig feeder - a drawing of which is supplied - is designed after a standard model recommended by the US Department of Agriculture. Use of these devices should result in a considerable saving of feed and labor. These feeders can be manufactured, knocked down, in the US and shipped out with either the first party, or with the animals.

14. Pig water: the basis of the requirement is 2 gal/pig/day, as recommended by the veterninarian consulted. A plan for an automatic water dispensing device is supplied. This can be used for both pigs and dogs, and can be connected to a pipeline carrying the fresh water. Use of this device should result in a great saving of fresh water, and of man power. The design submitted is a galvanized iron model, patterned after the cast concrete one designed and used by the US Department of Agriculture. These could be fabricated in the US and shipped out with the first party, or with the animals.

15. Animal exposure container: a) 100 of the large containers, or animal tanks are required. The Naval Medical Research Institute is prepared to undertake the testing and procurement of them. 60 will be used for pigs, and 40 for dogs. In addition to the large animals, small animals and biological and monitoring material can be placed in them. A test model of these tanks was exposed at SANDSTONE and functioned satisfactorily. Considerable study remains to be done concerning O_2 supply, CO_2 disposal, humidity control, temperature control, etc.; but this is to be done at NMRI. b) The tanks for exposing the mice are being designed, and will be constructed

1129

ed like buoys; and will be designed to hold at least 200 mice in separate removable cells, plus other biological and monitoring material. Approximately 40 of these will be required: 2 water lines, of 10 stations, with duplicates at each station.. c) Containers with shields for land-based animals are to be designed based on experience gained at Eniwetok and Bikini, and to meet the special conditions of the test program. These will be blast-tested at Inyokern before the final atomic weapons test.

16. Fresh water requirement: Maximum of 4000 gal/day

Basis for calculation of water requirement:	Gal/day
a: 3400 mouse cages, 100 ml/cage/day	85
b: Mouse cage sterilization	100
c: Dog water: 300 dogs, 1 gal/day plus	500
d: Pig water: 400 pigs, 2 gal/day plus	1000
e: Human water and lab; 150 men, 5 gal/day	750
Total, round numbers	2500

If automatic watering devices are not used, a water trailer must be provided, and a considerable excess of water supplied for the animals. We estimate that the animal requirement would double: 3000 gal/day, under this circumstance.

It is suggested that consideration be given to a plan to install gutters and downspouts leading to cisterns on the 4 buildings. Fresh rain water thus collected could be introduced into the animal fresh water line, and would result in a considerable saving.

17. Salt water requirement: sea water will be used for washing down the animal runways and penways, to wash the mouse cages and mouse buildings, for personnel bathing and sewage purposes. A tentative estimate is as follows:

a) Salt water supply and distribution line - 3" pipe at start;
b) Pump capable of delivering 90 lbs pressure to the line.
c) Distribution system to go to each animal runway, and to be equipped with ordinary garden-hose-type outlets.
d) Garden hose and nozzles for each animal runway-house.

18. Electric power requirement:	KW, max
a) Lighting, two laboratory buildings	5
b) 250 KW x-ray apparatus	5
c) Deep-freezes, three	20
d) Laboratory equipment, 2 lab buildings	25
e) Mouse buildings	1
f) Animal pens, etc	3
Approximate total	60 KW

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Current should be AC, preferrably 220 v, 3-phase, with 110v outlets.

19. Gasoline requirements: Amounts not determinable at this time.
   a) For two jeeps, and weapons carrier
   b) For two LCVP
   c) For reefer motor
   d) For field stoves for water sterilizer in mouse building.

20. Refrigeration requirement:
   a) 900 cu ft walk-in reefer, capable to holding contents at 35 - 40° F. This will serve several purposes: to hold fresh food, to hold carcasses of animals prior to autopsy, both during the LD50 calibration studies, and after the test shots. Many of the pigs can be butchered after autopsy, and the meat fed as fresh meat to the dogs. The reefer can also be used to store biological and other material, and should eliminate the necessity for additional small ice-boxes in the laboraotries.
   b) Deep-freezes: These are necessary for the quick-feezing of the material to be obtained during the serial sacrifice of the animals exposed as above. They will be required to contain large samples of plasma from 120 dogs and 120 pigs in each of the two tests. It is hoped to be able to freeze at least 100 ml samples of each animal. Various size specimens for histochemical and enzyme-study analysis will also be wrapped and quick frozen for holding and for shipment to the US for study at NMRI and by MD USA.

21. Projects 8, 9, 10, and 11 in the program do not require any special equipment or consideration, other than the special exposure containers in which similar biological material was exposed during the SANDSTONE shots. Sterile facilities for handling some of this material before the test will have to be provided, but this will appear in the laboratory equipment list.

22. The compilation of the foregoing was only possible because of the experience and knowledge available from the members of the staff of Captain R. H. Draeger's department at the Naval Medical Research Institute.

Respectfully submitted

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