

G. Bowen

LF-23

LF-23

LOVELACE FOUNDATION

for Medical Education and Research

AEC RESEARCH AND
DEVELOPMENT REPORT

UNCLASSIFIED



EXPERIMENTAL ANIMAL HOUSING FOR THE FISSION PRODUCT INHALATION PROGRAM

Albuquerque, New Mexico

by

H. C. REDMAN

August 1965

DISTRIBUTION STATEMENT A
Approved for Public Release
Distribution Unlimited

Reproduced From
Best Available Copy

ATOMIC ENERGY COMMISSION -
LOVELACE FOUNDATION
FISSION PRODUCT INHALATION PROJECT

20000919 017

LF - 23

Biology and Medicine

TID-4500 (43rd Ed.)

UNCLASSIFIED

EXPERIMENTAL ANIMAL HOUSING FOR THE FISSION PRODUCT
INHALATION PROGRAM

by

H. C. Redman

Submitted as a

Technical Progress Report

to

The Division of Biology and Medicine

United States Atomic Energy Commission

on

Contract No. AT(29-2)-1013

August 1965

From the Department of Veterinary Medicine

Lovelace Foundation for Medical Education and Research

Albuquerque, New Mexico

UNCLASSIFIED

ABSTRACT

The facilities for holding and supporting the experimental animal colonies designed and constructed as a portion of a building complex comprising the AEC Lovelace Fission Product Inhalation Laboratory were briefly described. These included kennels and a metabolism building for dogs, rooms for small animals, and a colony support building incorporating isolation wards, a diagnostic laboratory, a surgical suite and diagnostic X-ray equipment.

ACKNOWLEDGMENTS

The author wishes to express his gratitude to Dr. C. S. White, Dr. T. T. Mercer and Dr. R. G. Thomas who contributed collaboratively to the concept and design of the animal facilities. The author is indebted to Dr. C. S. White and Dr. W. E. Clapper for their helpful suggestions in preparation of the manuscript, to Mr. Emerson Goff for preparing and processing the illustrative material and to Miss Paulyn A. Gaffney and Mrs. Nancy Nichols for typing the preliminary and final manuscripts.

TABLE OF CONTENTS

	Page
ABSTRACT	i
ACKNOWLEDGMENTS	ii
LIST OF TABLES	iv
LIST OF FIGURES	iv
I. INTRODUCTION	1
II. ANIMAL FACILITIES	2
A. General	2
B. "Large" Animal Quarters	2
1. Kennels	2
a. External Arrangements	2
b. Internal Details	7
2. Canine Metabolism Rooms	12
C. "Small" Animal Quarters	12
1. "Small" Animal Rooms	12
2. Central Wash Area	16
D. Veterinary Hospital	16
1. Isolation Wards	16
2. Diagnostic Laboratory	16
3. Surgical Suite	19
4. Diagnostic X-ray	19
E. Colony Support Area	19
F. Miscellaneous and Summarizing Items	22
1. Summary of Experimental Animal Housing in Square Feet	22
2. Colony Support Building	22

LIST OF TABLES

	Page
TABLE 1. Gross Square Foot Summary	23

LIST OF FIGURES

FIGURE 1. Block Diagram of Facility	3
2. Abbreviated Floor Plan of Dog Kennel	4
3. Elevations of Dog Kennels	5
4. Kennel from Above.	6
5. Sectional Drawing of Internal Cubicle and External Run (and drain) of Kennel.	8
6. Depressed Aisle Within Dog Kennel	9
7. Guillotine Door	11
8. Metabolism Room	13
9. Small Animal Room	14
10. Small Animal Room and Cages	15
11. Cage and Bottle Washers	17
12. Laboratory Views	18
13. Surgical Suite	20
14. Diet Storage and Preparation Area	21
15. Utensil Wash and Storage Area	21
16. Colony Support Building	24

EXPERIMENTAL ANIMAL HOUSING FOR THE FISSION PRODUCT INHALATION PROGRAM

by

H. C. Redman

I. INTRODUCTION

Initiation of a long-term program undertaken by the Lovelace Foundation for the Division of Biology and Medicine of the Atomic Energy Commission to assess the biological effects of inhaling fission products singly and as mixtures required, among other things, mounting operations in Veterinary Medicine to provide and care for experimental animals needed to support the project. Though the overall activities were planned to utilize space made available by the Foundation at headquarters in Albuquerque and by a new laboratory constructed by the Atomic Energy Commission at a field site on Sandia Base, 11 miles to the southeast, provisions were made for the main animal colonies at the field installation. These, flexible enough in design to house a variety of different animal species, are currently used to hold "large" (beagles) and "small" (mice, rats and guinea pigs) animals and also include breeding kennels for the dogs. The several units for animals were integrated with other laboratory buildings into a complex that also provided quarters for the Departments of Aerosol Physics, Radiobiology and Veterinary Medicine, as well as a variety of administrative and additional supporting activities.

Because the new animal facilities, the last of which were completed for useful occupancy in early 1965, have interested many visitors and relevant information has been requested by a variety of individuals, it was thought an assembly of descriptive data would prove useful. Accordingly, the following material will describe in turn the housing for "large" and "small" animals, the veterinary hospital and other support areas. Detail will not be exhaustive, but sufficient to indicate the overall size, the type of construction, wall and floor finishes, environmental controls, utilities and some accessory equipment.

II. ANIMAL FACILITIES

A. General

As shown diagrammatically in Figure 1, the animal facilities for the Fission Product Inhalation Program can, for descriptive purposes, be divided into three parts; namely, that concerned with dogs (or other "large" animals), with "small" animals and with colony support activities.

The kennels, eight in number, include two for breeding purposes, two for maturing dogs and four to house experimental subjects. In addition, a rectangular building includes 16 rooms for dog metabolism cages.

The "small" animal colonies are housed in 10 rooms, located as noted in Figure 1, in one of the main wings of the Fission Product Laboratory.

The colony support building, also including a mechanical area to serve the entire facility, houses the veterinary hospital with its laboratory and surgery, and the area for storing and preparing food.

Each segment of the facility used to hold and support the experimental animal colonies will now be described more fully.

B. "Large" Animal Quarters

1. Kennels

a. External Arrangements

Each kennel, rectangular in shape and divided longitudinally by a central hall leading into an area on one end containing a utility and two examining rooms, has the dimensions shown in Figure 2. Other than these end areas, all kennels are 84 ft., 6 in. long and 48 ft., 8 in. wide with an 6 ft., 4 in. central hall. Each one has a similar external appearance as shown in the elevation diagram in Figure 3 and the photograph in Figure 4 and contains a total of 50 external runs, 25 to a side.

The 3 x 16 ft. runs, separated below by a concrete curb and above by galvanized wire fencing except for the concrete-block wall dividing groups of five (see Figure 4), slope at one-quarter inch per foot

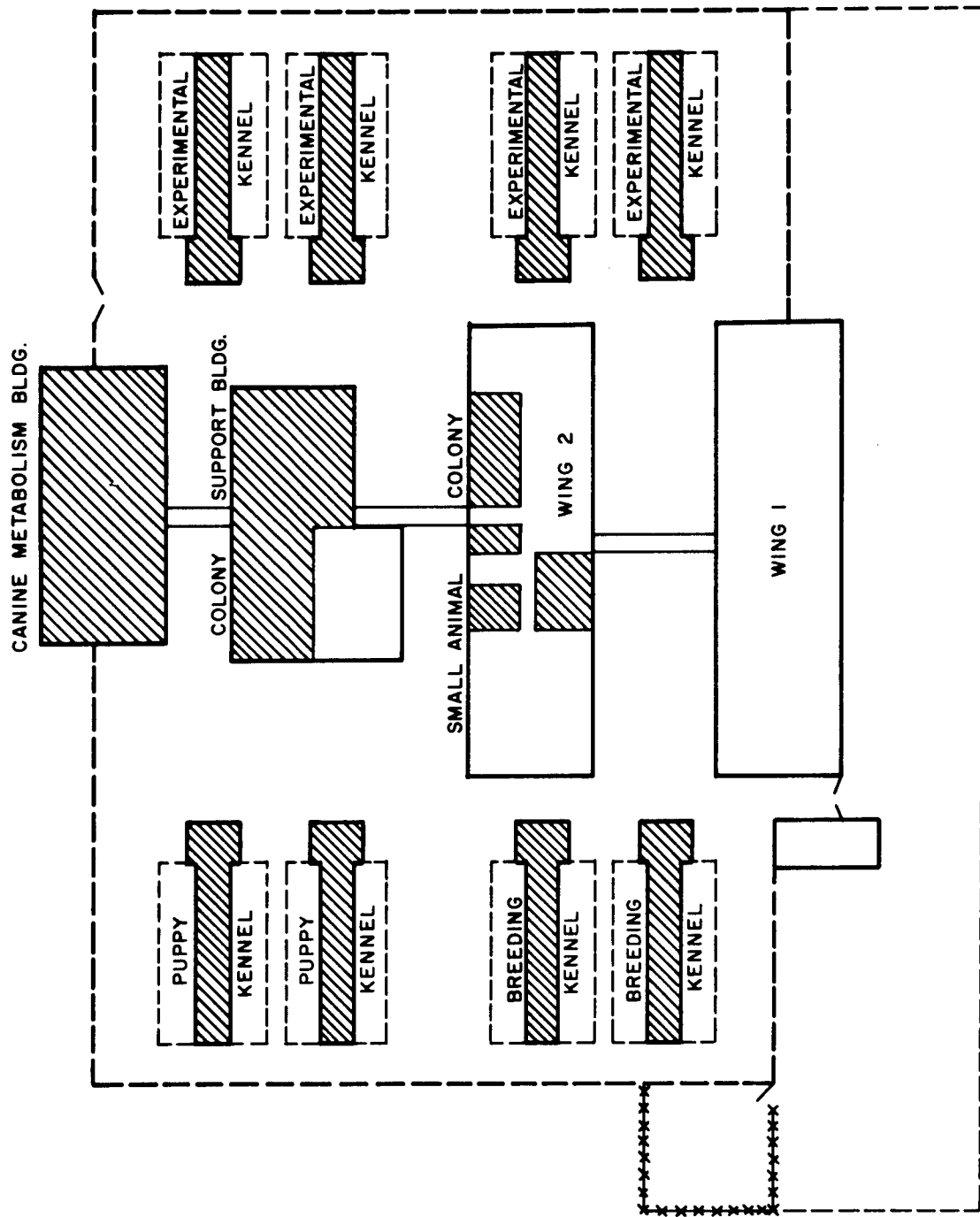


Figure 1. Block Diagram of Facility

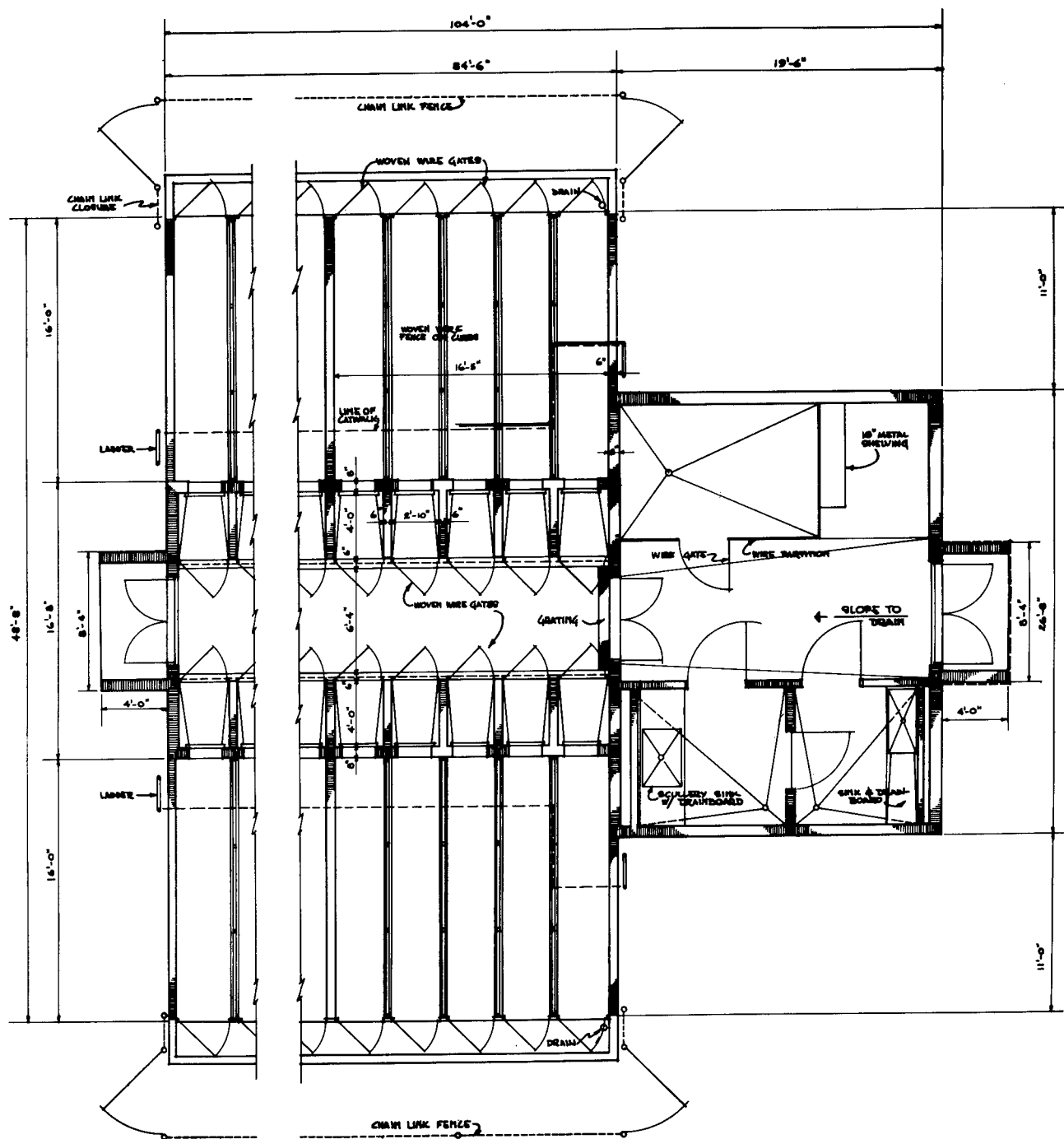
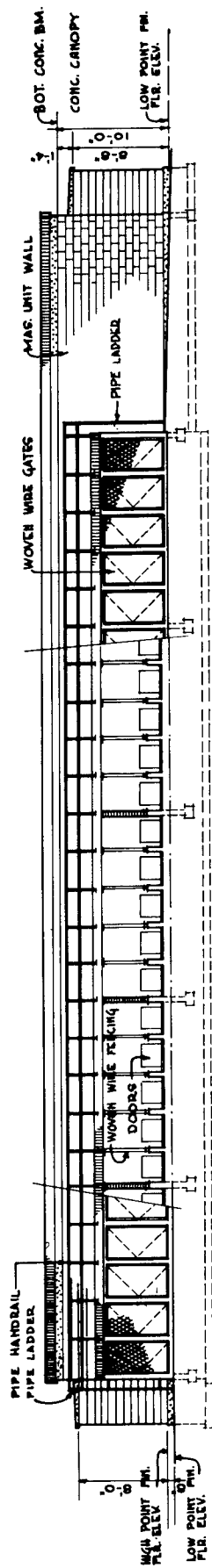
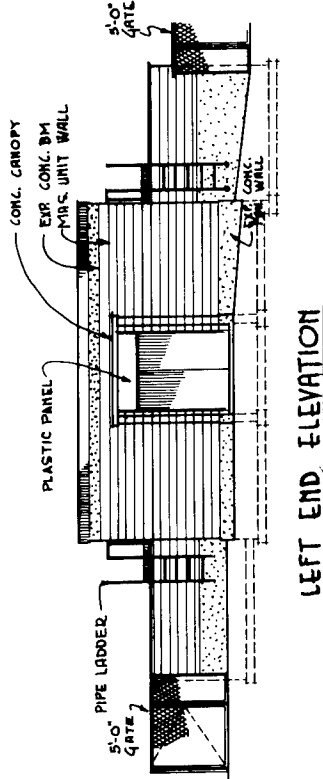


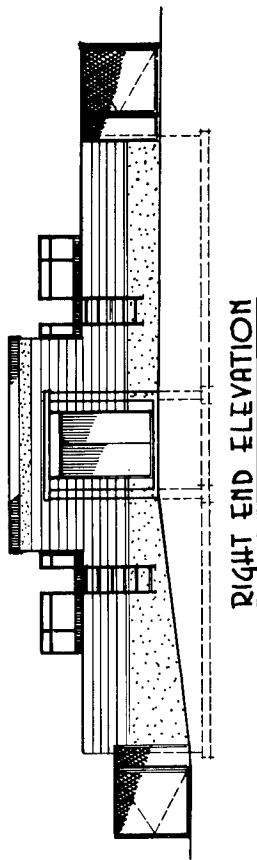
Figure 2. Abbreviated Floor Plan of Dog Kennel



SIDE ELEVATION



LEFT END ELEVATION



RIGHT END ELEVATION

Figure 3. Elevations of Dog Kennels



LOVELACE FOUNDATION
EMERSON GALT - KENNEL PHOTOGRAPH

Figure 4. Kennel from Above

away from the buildings into a drain as shown in Figure 5. Each may be entered by a gate at the drain end and may be washed down from catwalks located either near the gate or abutting the lateral wall of the buildings as noted in Figures 4 and 5.

To facilitate wash down, each kennel was equipped with Mikro-spray* units and hot and cold water outlets on the inside. Also the external cement runs, all the bordering block walls, as well as the associated internal cubicles, were given an epoxy-resin coating in an attempt to obtain a surface impervious to both debris and moisture.

German to minimizing moisture, either to prevent freezing following wash down in cold weather or to aid drying after cleaning, pipes through which warm antifreeze solution can be circulated were placed in the floor of the external runs and the internal cubicles. The system works well and not only is the floor of the open run held above 32°F in the winter, but the deck of the internal cubicle can be kept at 100°F if desired. We are indebted to the Radiobiology Division of the Department of Anatomy, University of Utah College of Medicine, for their suggestions on the design of this system.

To complete the external installations, galvanized wire fences parallel with the long axis of appropriate buildings, were installed 4 to 6 ft. from the end of the open runs, except where the adjacent kennel serves this purpose as shown in Figure 4. Finally, the area near the kennels and inside the wall around the entire facility was stabilized with black top to aid in keeping dust at a minimum and to help prevent invasion of the kennels by the local animal population.

b. Internal Details

Except for two noteworthy details which will now be mentioned, all eight kennels shown in Figure 1 are essentially similar internally. The differences involving only the two breeding kennels were first, the inclusion of a depressed aisle as shown in Figure 6, a fact that

*Economics Laboratory, Inc., St. Paul, Minnesota.

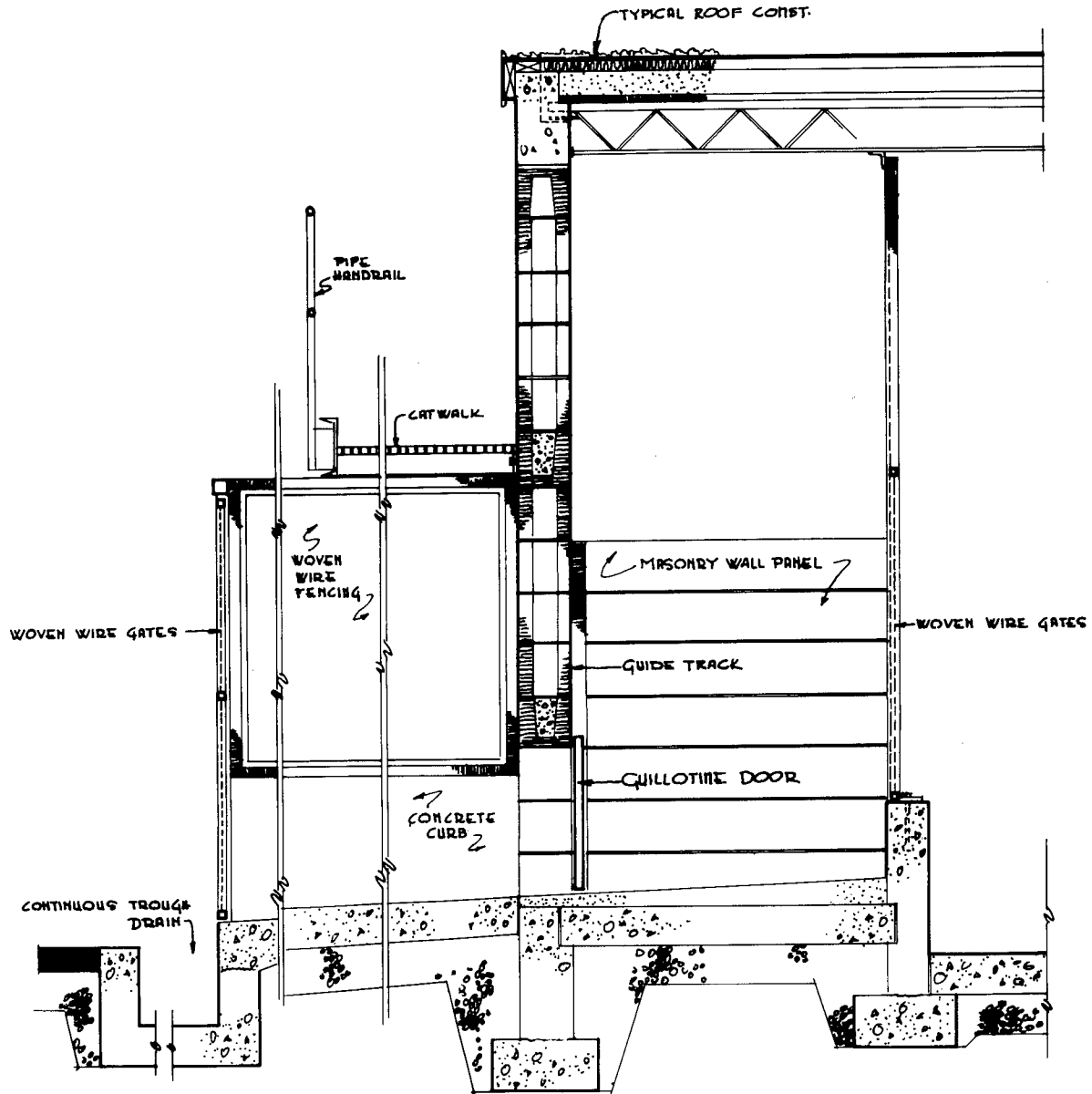


Figure 5. Sectional Drawing of Internal Cubicle and External Run (and drain) of Kennel

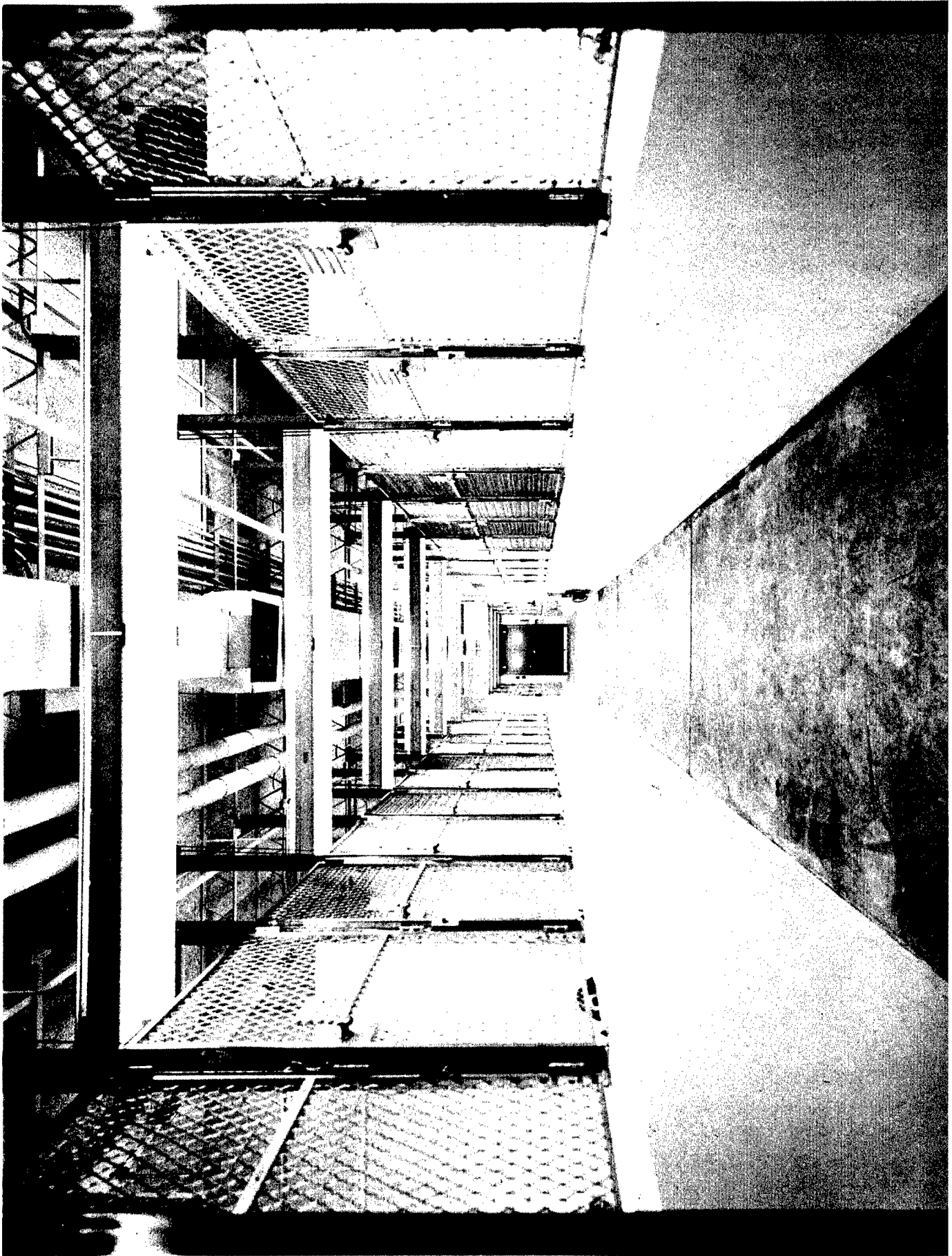


Figure 6. Depressed Aisle Within Dog Kennel

involved constructing the floors of the central halls 2 ft. below that of the internal cubicles; and second, applicable only to the initially constructed breeding kennel, the use of a movable panel between every other one of the internal cubicles, a contingency that allows a large litter of puppies to use two cubicles and runs if desired. Both of these features, regarded currently and in the early planning stage as desirable, were eliminated from the remaining kennels in the interest of economy.

The 50 internal cubicles, located 25 on each side of the central hall which in seven kennels is only slightly below the elevation of the cubicle floor as shown in Figure 5, have inside dimensions of 4 ft. by 2 ft., 10 in. They are separated from one another by concrete-block partitions. The front or aisle side is closed by a wire gate. The opposite wall of each cubicle was provided with a guillotine door as shown in Figure 7, which when raised gives a 16 by 16 in. opening that facilitates efficient cleaning of the internal cubicle. Each door has a 10 by 12 in. opening closed by a one-half inch flexible rubber swing panel that allows the dogs "free" access to the external run. Arrangements were made to close the opening outside with an aluminum drop panel not only to confine animals during inclement weather and while cleaning the external runs, but to give a reasonably "wind-tight" fixture during cold, gusty weather.

As mentioned previously, the floor of the cubicles were treated with an epoxy-resin coating to facilitate wash down. Epoxy was also applied to the block walls but the floor of the central hallway was finished with a concrete sealer. Otherwise, all the internal surfaces including the exposed pipes in the ceiling were painted a light shade to facilitate lighting.

Temperature control within 5°F is maintained in the summer using roof-mounted, swamp coolers for air conditioning. In the winter, area-type, hot-water-supplied heating units equipped with blowers were provided to supplement the radiant heat emanating from the floors of the cubicles, which, as mentioned above, contained pipes for circulating warm, anti-freeze solution. Pumps to operate and control the radiant system were located in the utility room of the end section of the

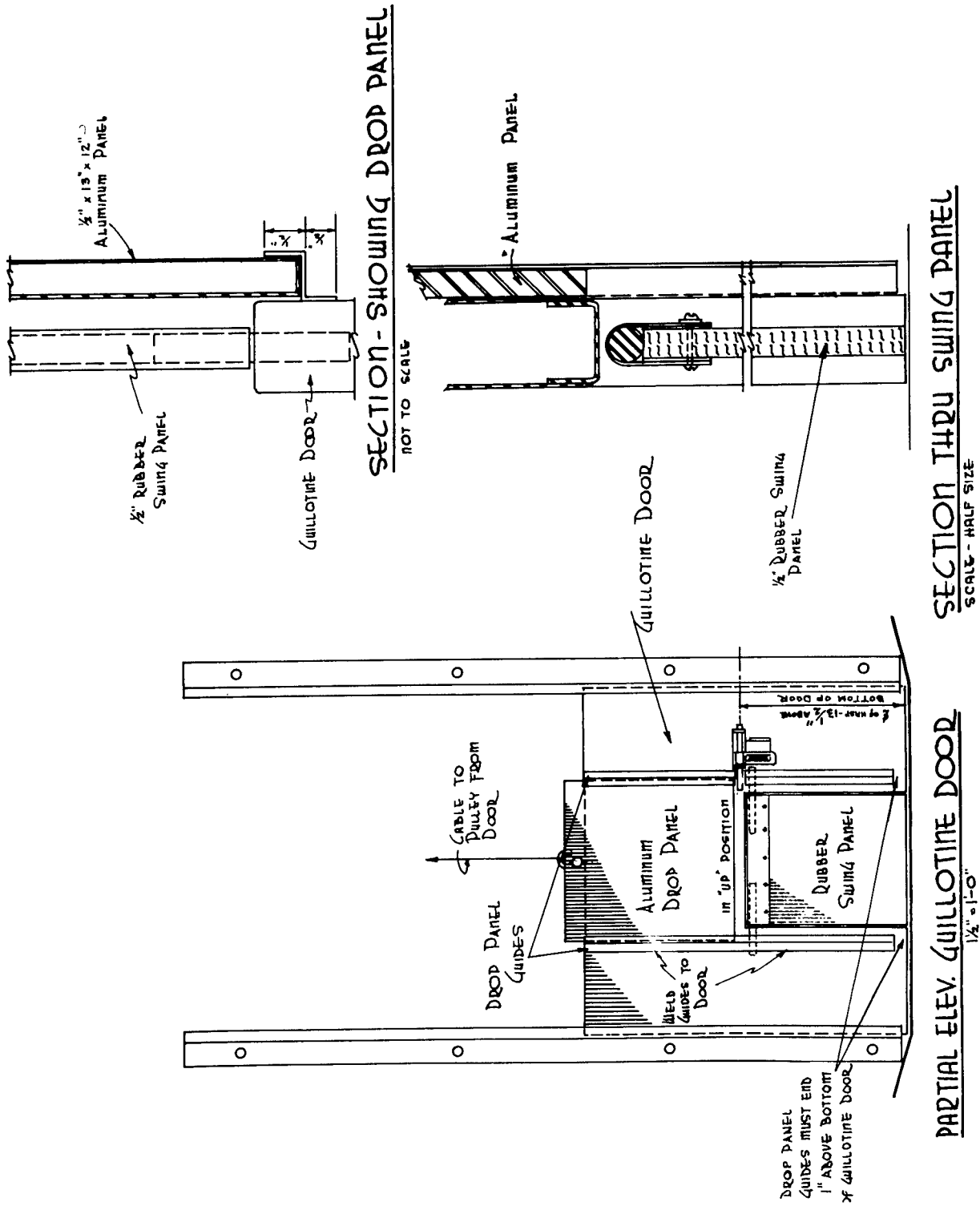


Figure 7. Guillotine Door

kennels along with a heat exchanger supplied from boilers situated in the centralized mechanical area serving the entire facility.

2. Canine Metabolism Rooms

Sixteen 10 x 25 ft. rooms to house metabolism cages shown in Figure 8 were included in the canine metabolism building. The concrete floors, the walls and ceilings that were plastered with concrete, and the internal surfaces of the doors, were covered with epoxy-resin. To avoid undue slickness, the floors were treated with sand before the last coat of epoxy was applied.

Each room, provided with floor drains, lighting from above and eight exchanges of air per hour with no recirculation, can be held to within 2°F with the ventilating system that furnishes mixtures of "warm" and "cold" air to achieve the temperature desired. In summer the "cold" air is obtained by refrigeration and not by evaporation.

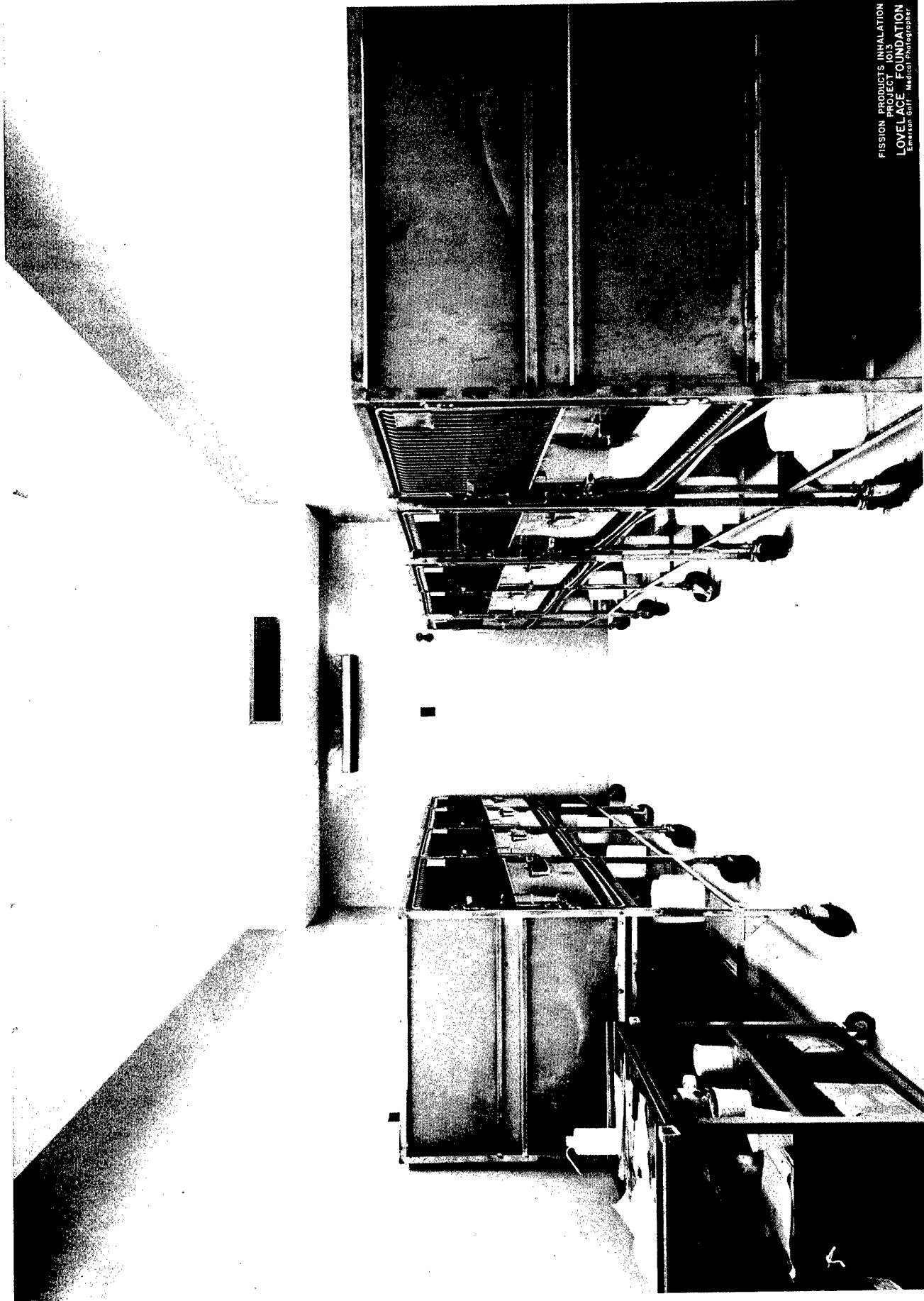
The total animal capacity of the dog metabolism building is, among other things, a function of the size of the metabolism cages employed. With the type of cages shown in Figure 8, the metabolism building will accommodate a maximum of 208 dogs, 1 to a cage and 13 cages to a room.

C. "Small" Animal Quarters

1. "Small" Animal Rooms

The ten 10 x 25 ft. rooms used to house different species of small animals are generally similar in design to that described for the canine metabolism rooms including floor drains and an impervious epoxy coating on the floors, walls and ceilings. In addition, however, the "small" animal rooms are equipped with sinks, cabinets and counters as shown in Figures 9 and 10 which also indicate two different arrangements of caging in current use. To the ventilation system, generally similar to that for the canine metabolism rooms but capable of providing 12 changes of air per hour without recirculation, humidity control within a 5 percent range was added for the "small" animals.

Finally, the provision of Micro-spray units allows the "small" animal rooms to be thoroughly washed and sanitized, and for convenience



FISSION PRODUCTS INHALATION
PROJECT 1013
LOVELACE FOUNDATION
Emerson Golf - Medical Photographer

Figure 8. Metabolism Room

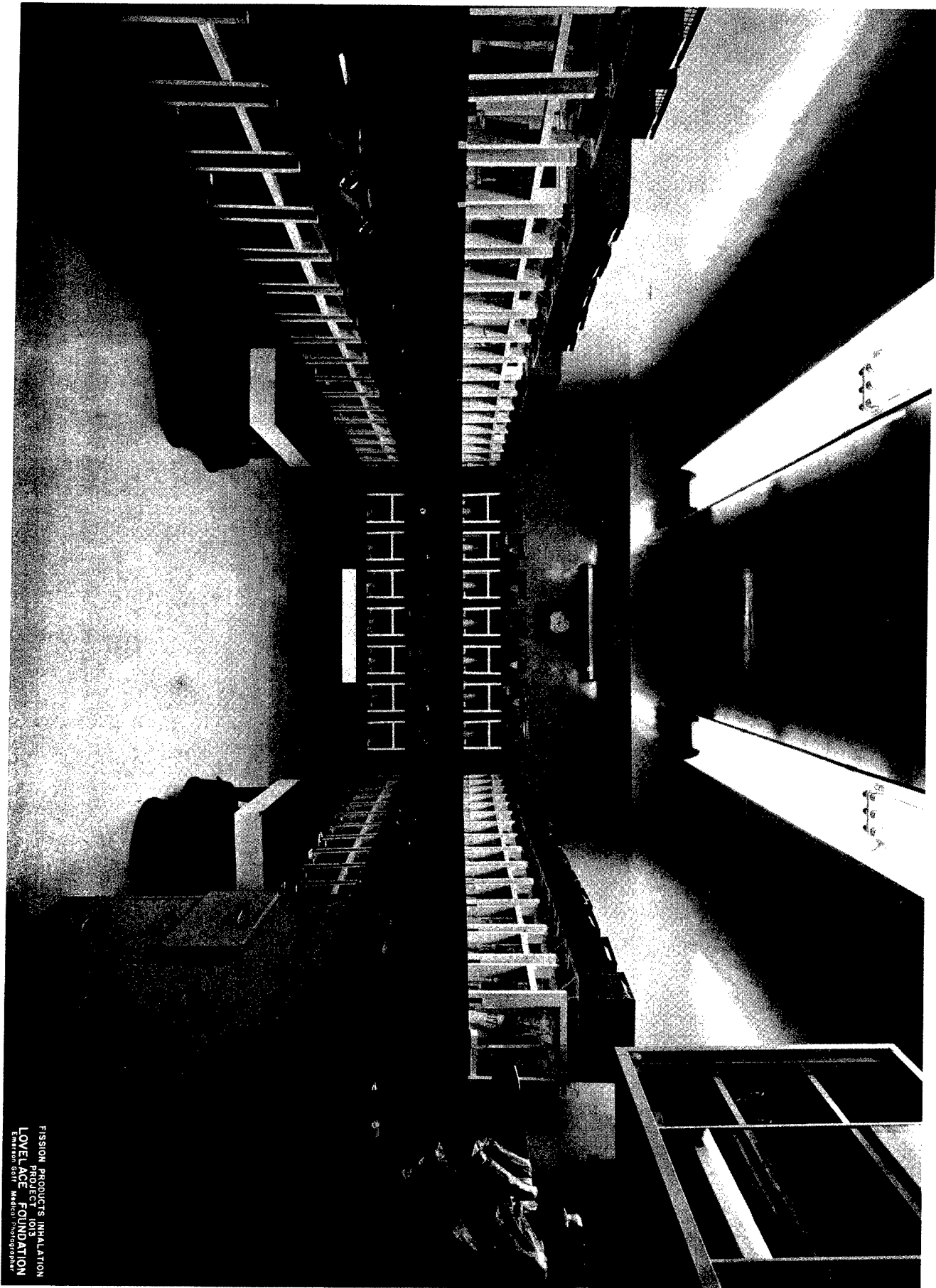


Figure 9. Small Animal Room

FISSION PRODUCTS INSTALLATION
LOWEL ACE FOUNDATION
Emerson City, Maryland

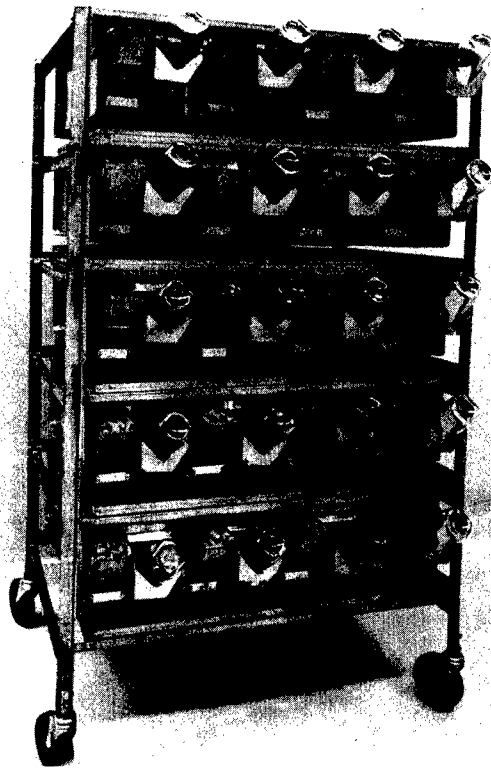


Figure 10. Small Animal Room and Cages

a near-by, small area was made available for general purpose storage.

2. Central Wash Area

A central wash area, serving the entire animal facility and located in a 13 x 25 ft. room, was equipped with an automatic cage washer^{*}, shown in Figure 11, and as also noted in Figure 11, an automatic water-bottle filler and a water-bottle washer^{**} that automatically rinses after washing with detergent.

D. Veterinary Hospital

The veterinary hospital, located in the colony support building shown in Figure 1, consists of isolation wards, a diagnostic laboratory, a surgical suite and a diagnostic X-ray area. These will be briefly described.

1. Isolation Wards

There are three isolation wards, each 10 x 15 ft., opening to the exterior at one end and at the other into a 10 x 10 ft. examining room which in turn opens into the hall of the colony support building. These wards are employed to isolate all incoming animals, as well as any member of the colony suspected of having an infectious disease. All wards and examining rooms were constructed with concrete coated walls and ceilings which are epoxy coated. Each has 4 in. drains and is equipped with Mikro-spray units to facilitate wash down and sanitation.

The wards are equipped with portable dog cages (on wheels) and each associated examining room was provided with a sink, hot and cold water, and an examining table and cabinet for storing supplies.

2. Diagnostic Laboratory

Figure 12 shows two views of the diagnostic laboratory contained in two 25 x 10 ft. modules of the colony support building. Within this area, a separate room (one-half module) was set aside originally for hematology. The laboratory equipped with fairly standard furniture and utilities, serves the needs for doing the routine laboratory work, such as

* Model 6000, Better Built Machinery Co., New York, New York.

** Model 3000, R. G. Wright Co., Buffalo, New York.

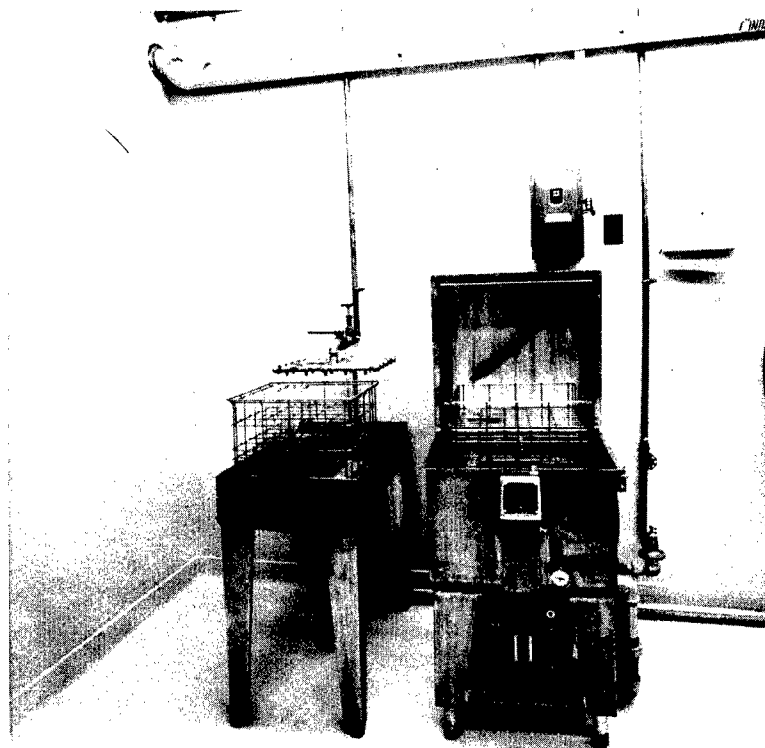
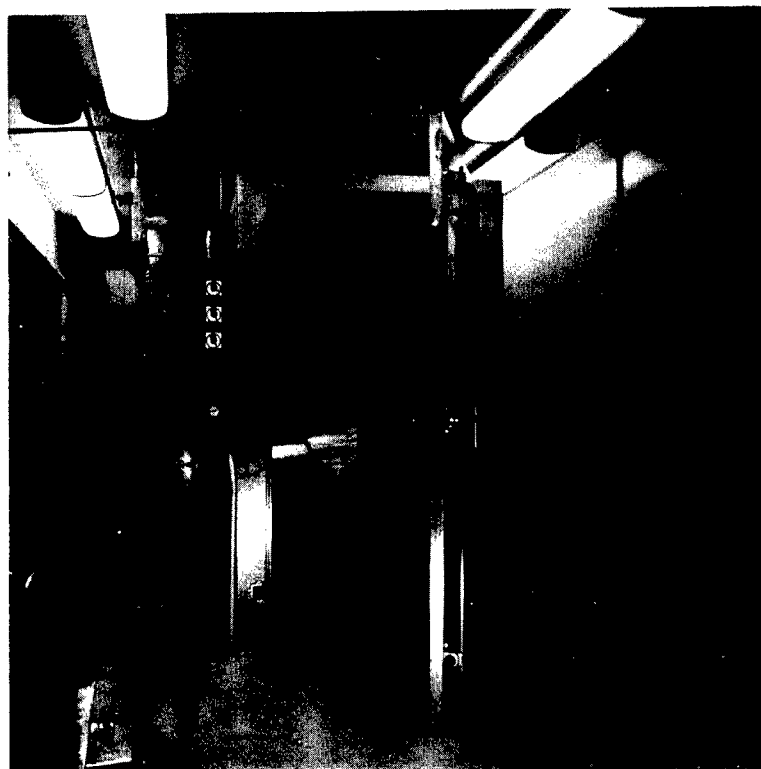


Figure 11. Cage and Bottle Washers

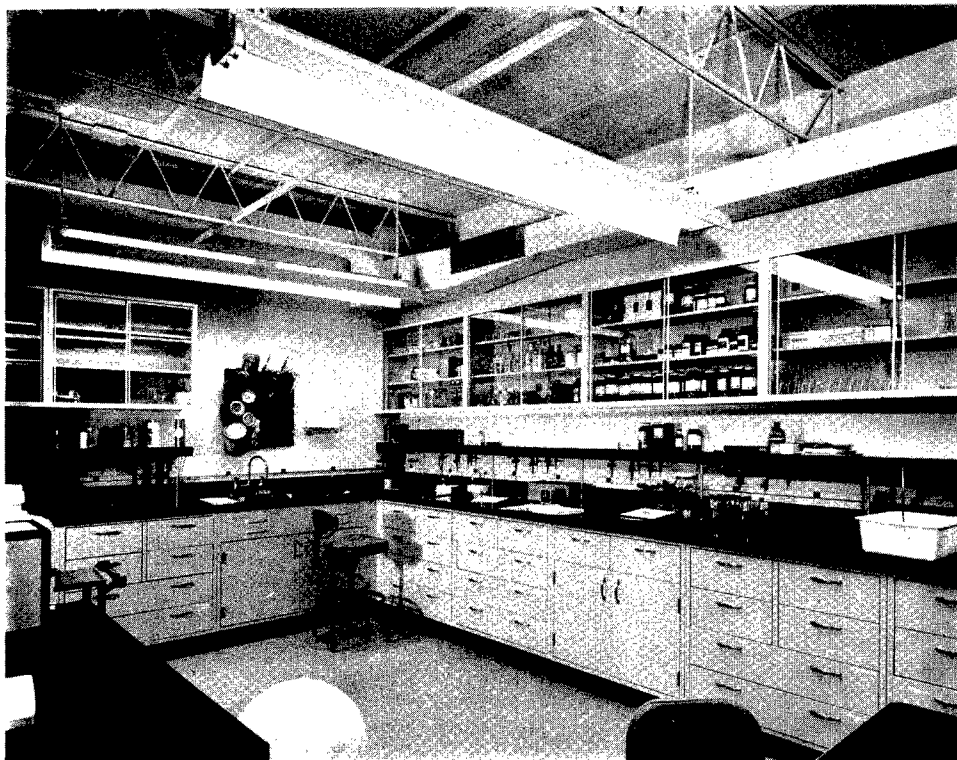


Figure 12. Laboratory Views

fecal examinations, urinalyses and bacteriological procedures, that is required for maintaining healthy animal colonies.

3. Surgical Suite

The surgical suite of the veterinary hospital, occupying two 25 x 10 ft. modules, consists of a 10 x 10 ft. surgical ward with portable dog cages; a 10 x 15 ft. surgery, a view of which is shown in the top portion of Figure 13; a 10 x 15 ft. surgical preparation room, a photograph of which is reproduced in the bottom of Figure 13, and a 10 x 10 ft. area used for cleaning and storing instruments.

The surgical suite, except for the floor, is epoxy-resin coated throughout. The floor is tile. Explosion proof fixtures and a conducting floor were provided in the surgery which was also equipped with a ceiling-mounted surgical light, a standard laboratory bench and sink and an adjustable surgical table.

The surgical preparation area, equipped with sinks, utilities and a lab bench, also included a wall-mounted water still with an auto-clave.

4. Diagnostic X-ray

A diagnostic X-ray facility was developed in the 10 x 25 ft. module next door to the surgical suite. This includes an X-ray machine^{*}, a dark room for developing film and an area for preparation of animals for the required X-ray procedures.

E. Colony Support Area

The colony support area, also developed within the colony support building, can be described in three parts. The first, utilizing three 10 x 25 ft. modules, includes room for diet preparation and storage (Figure 14), washing utensils (Figure 15), a power mixer, refrigerator and a walk-in freezer.

The second part of the colony support area consists of a personnel locker and wash room, both housed in one 10 x 25 ft. module.

* Model 200, 200 ma., 100 Kvp., Universal X-Ray, Inc., Chicago, Illinois.

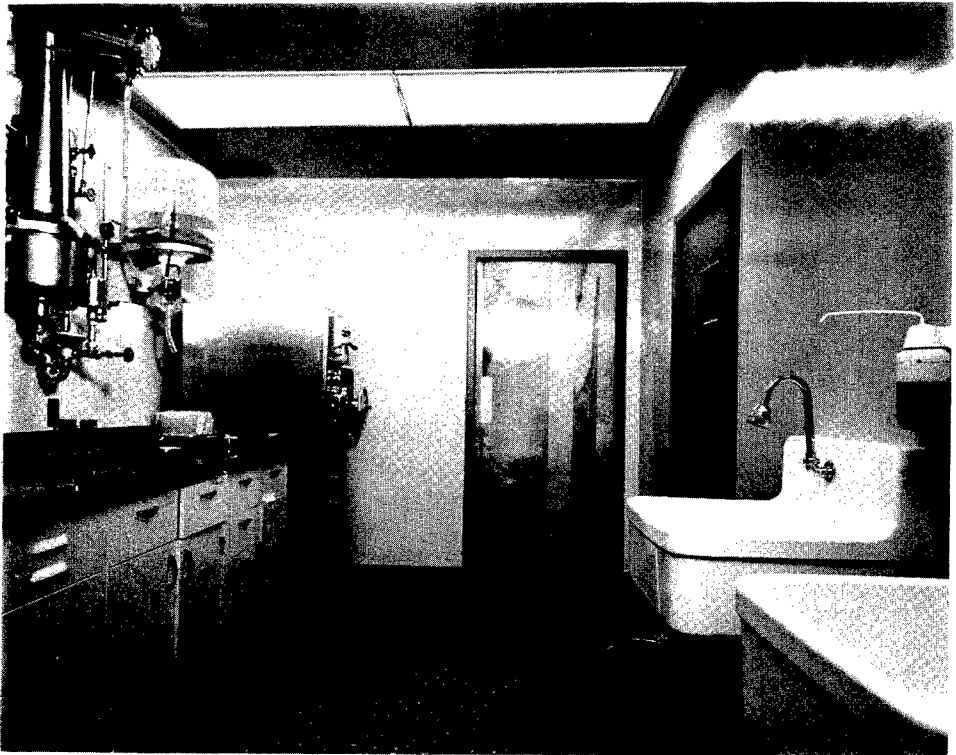
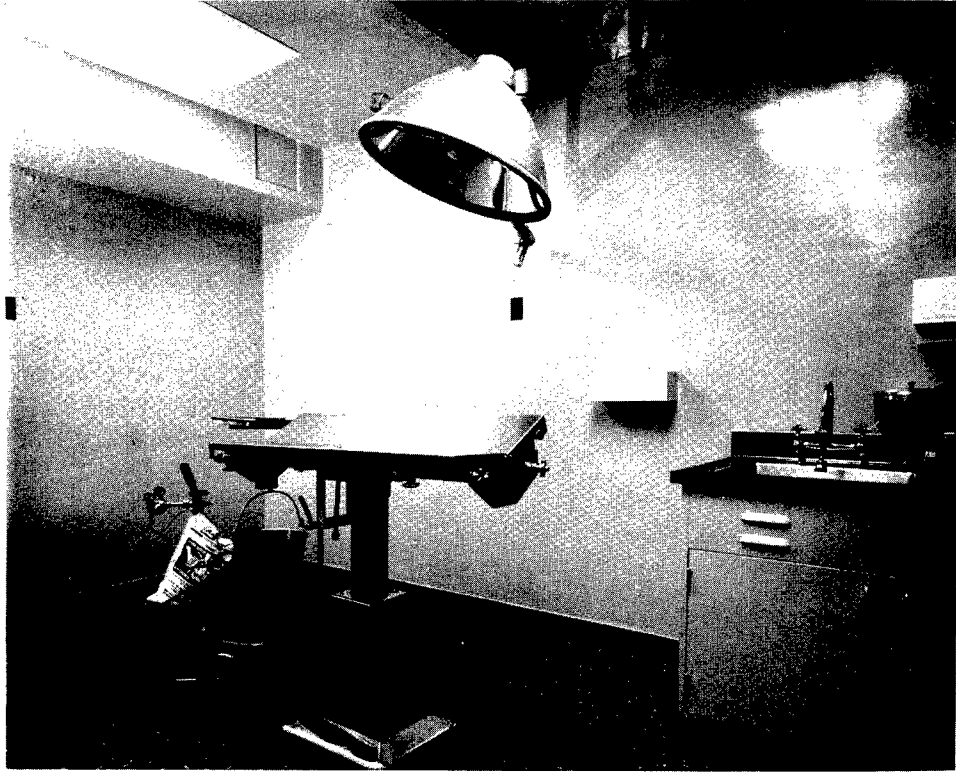


Figure 13. Surgical Suite

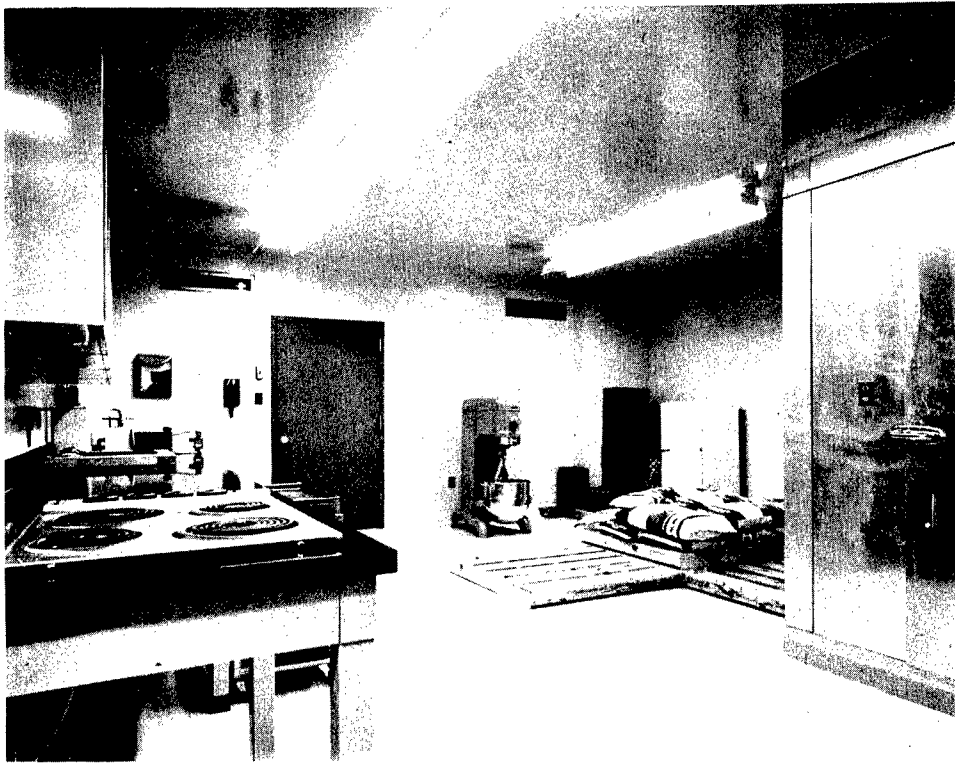


Figure 14. Diet Storage and Preparation Area



Figure 15. Utensil Wash and Storage Area

The third and final area, providing four offices, including those for two veterinarians, occupies two 10 x 25 ft. modules.

F. Miscellaneous and Summary Items

1. Summary of Experimental Animal Housing Square Feet

In summary it was thought desirable to include information on the square footage included within the experimental animal housing. As noted in Table I, there are 51,600 sq. ft. which includes the uncovered dog runs as well as all roofed areas.

2. Colony Support Building

This building located within the complex, Figure 1, contains the veterinary hospital, and colony support areas, as previously described, and the central mechanical room for the entire laboratory. The arrangement of each of these functional units is shown in Figure 16.

TABLE 1

GROSS SQUARE FOOT SUMMARY

Kennel 1	(1,940 roofed)	4,340
Kennel 2	(1,940 roofed)	4,340
Kennel 3	(1,940 roofed)	4,340
Kennel 4	(1,940 roofed)	4,340
Kennel 5	(1,940 roofed)	4,340
Kennel 6	(1,940 roofed)	4,340
Kennel 7	(1,940 roofed)	4,340
Kennel 8	(1,940 roofed)	4,340
Canine Metabolism Building		7,400
Small Animal Quarters (portion of Laboratory Wing 2)		3,750
Veterinary Hospital and Colony Support Area		5,730
		<hr/>
	Total Gross Square Feet	51,600

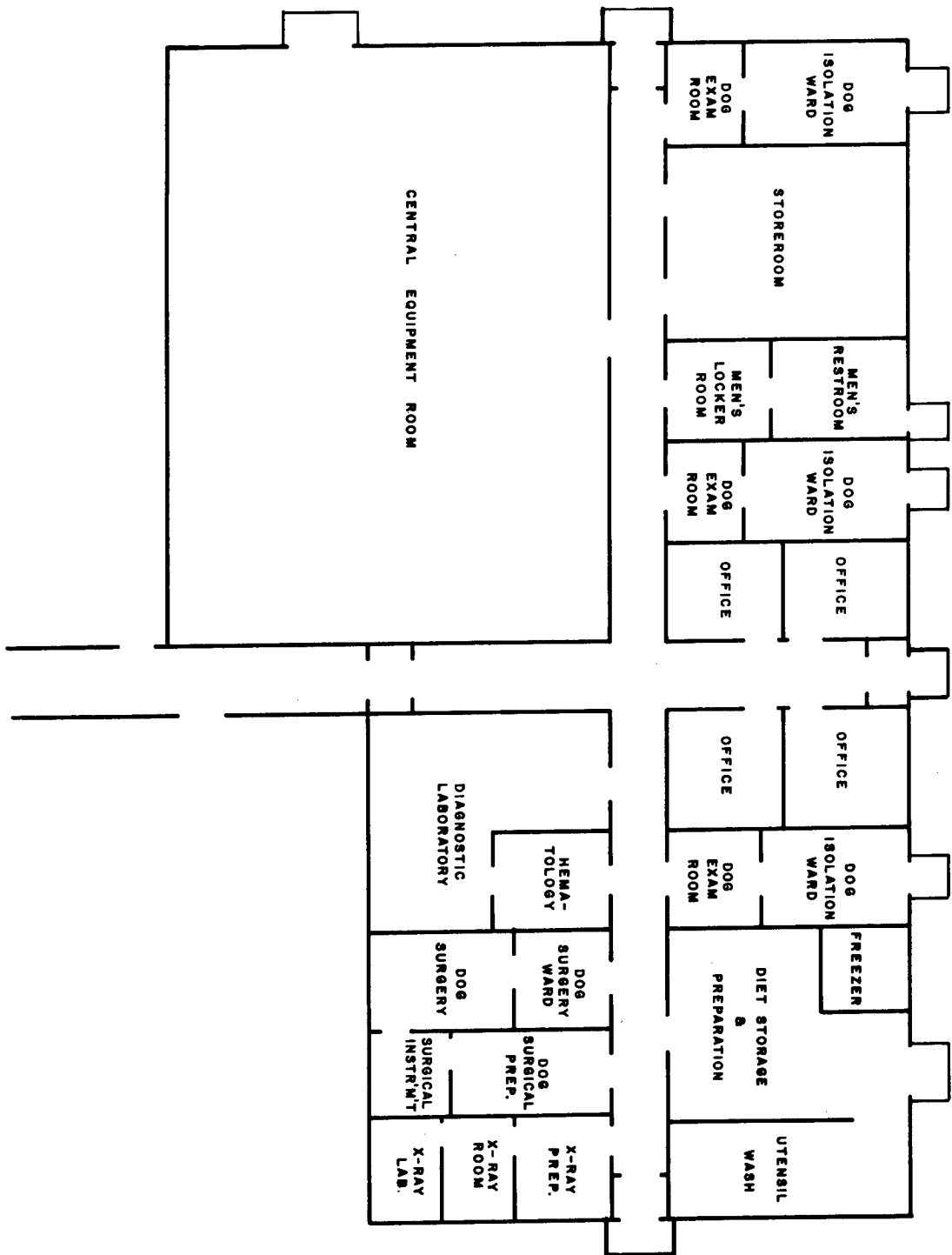


Figure 16. Colony Support Building