OVERVIEW

It is the intention of ORS/DES to provide quality state-of-the-art research facilities so that NIH can maintain and enhance its position as the world's leading biomedical animal research institution. In order that NIH maintain its pre-eminent research position, it will have to rehabilitate older animal research facilities as well as construct new ones. It is also important that NIH's facilities be capable of meeting ever-changing animal research requirements; therefore the design of these facilities must be flexible and adaptable. A vivarium must provide for the health, safety and comfort of the vivarium staff and an environment for highly sensitive animal subjects compatible with research needs. This means that the work environment should be devoid of unpleasant animal odors and animal allergens, visually pleasing to employees and supportive of investigators engaged in animal research. Research animals should not be housed in laboratories for the convenience of the researcher.

Animal Research Trends

It is predicted that there will be a decline in the use of dogs, cats, and non-human primates as research subjects. Future animal research will probably require greater emphasis on precise environmental control for a smaller number of expensive, microbiologically and genetically engineered rodent species.

Transgenics now a common investigative technique requiring special needs. Because of its genetic diversity, the laboratory mouse provides a practical means for studying mammalian gene function. Due to the need to protect unique animal subjects from adverse environmental influences, housing conditions are more critical for transgenic animals and immunologically deficient rodents than for conventional research animals. The growing use of virus-antibody-free (VAF) animals further dictates that the facility design must provide rigid environmental controls.

VIVARIUM ACTIVITIES

The primary activities in the vivariums will be scientific research involving experimentation on animals. Other primary activities include the care, feeding, monitoring and housing of animals.

The secondary activities performed in the vivariums are administrative, and animal support functions such as cage wash, storage areas, etc. Space should be provided to house administrative activities such as office space for the veterinarians, their secretarial and support staff. Areas should be provided for lounges and lockers for animal care staff. Areas for building support activities shall also be provided such as mechanical distribution and equipment, storage, shipping and receiving, etc.

Animal Activity: According to the *Guide for the Care and Use of Laboratory Animals*: Animals maintained in a vivarium environment might have a somewhat restricted activity compared to their natural state. The animals need for supplementary exercise or induced activity is subject to the judgment of the animal care professional, based on his or her knowledge of the species or breed and the animal's temperament, age, history, physical condition, expected duration of vivarium residence and the research protocol. Examples of supplementary activity include: treadmills, exercise wheel, leash-walking, runs, or animal exercise rooms. For large farm animals, such as sheep, horses and cattle, loafing areas, exercise lots, and pastures are suitable. Provision should be made for animals with specialized locomotor patterns to express these patterns, especially when animals are held for long periods. For example, ropes, bars, and perches are appropriate for brachiating (swinging in branches) non-human primates.

Animal Enrichment: Depending on the nature of the research and without sacrificing safety, consideration should be given to providing: natural light; adequate exercise and well-equipped play areas with toys, games and TVs;

group housing; and a means for animal communication. These are some of the features that will enhance animal enrichment. It should be pointed out that the *Guide for the Care and Use of Laboratory Animals* does not recommend windows or skylights in animal rooms because they can contribute to unacceptable variations in environmental characteristics such as temperature and photo period. However, in the Silvio Conte Building, NIH uses windows in some of the animal rooms. Prior to recommending windows for the facility, consultation should be held with the lead veterinarian.

VIVARIUM PROGRAMMATIC OBJECTIVES

Modular Space Planning: Space must be carefully organized on a modular basis free of closed-in stairwells, chases, shafts, shear walls, elevators and all other obstructions, save regularly spaced structural columns. There is no set planning module dimension for vivariums. The horizontal dimension of the structural bay must be a multiple of the planning module or primary building module dimension for maximum flexibility and to allow uniform points of connection for vivarium services. Modules must be organized in a manner that allows space to be easily reconfigured.

Flexibility: The vivarium and its utilities should be planned for flexibility so that it can be readily adapted to accommodate future changes in research protocol, and animal species. Vivariums are costly to construct, and they should not be rendered functionally obsolete due to minor changes in the state-of-the-art technology or change in animal populations. Planning should permit maximum adaptation to changing needs at a minimal cost; though the flexibility itself may add to initial cost. Life cycle costs of features that provide flexibility should be analyzed.

Capability: The vivarium must have the utility services necessary for the scientists to conduct their research and the veterinarians to care for the animals properly. It is equally important that provisions be made for future utility services to accommodate unanticipated demands brought about through improvements in technology or through changes in research protocols. Reserve capacity should be designed into the primary building utility systems to accommodate future levels of growth and change. Expansion of the vivarium should be considered during the planning phase. It must be possible to construct any expansion with minimal interference to the operation of the facility.

QUALITY OF LIFE

The environment of the vivarium should be visually pleasing to the employees and consistent with the needs of the animal research. The vivarium should be efficient, secure, and easy to maintain. Sufficient air supply, filtration, and exhaust must be provided to minimize unpleasant animal odors and allergens. Natural light, adequate work space, color, furniture and equipment are essential for a pleasant and functional work environment.

GENERAL VIVARIUM PLANNING PARAMETERS

Circulation

Personnel, equipment and supplies should move from areas of least contamination to areas of greater contamination. Soiled cages should move from animal rooms to the "dirty" side of the cage wash area and pass through to the "clean" side. The cages should then return to animal rooms with minimal opportunity for contamination.

There are two basic types of corridor systems, the single corridor system and the dual corridor system. Dual corridors are generally avoided in small to medium size facilities due to the extra space required by dual corridors. The

minimum corridor width is 2 100 mm for both types of corridors.

Single Corridor System: The advantage of the single corridor is the efficient use of space. The disadvantages of the single corridor are:

- personnel, animals, cages, equipment, and supplies move in both directions, possibly leading to disruption of traffic flow;
- contact between clean and dirty materials may result in contamination of the cleaner material.

Single corridor systems must be equipped with appropriate contamination barriers such as air-locks to insure facility safety.

Dual Corridor System: The dual corridor system's main advantage is a reduction in contamination of clean equipment. The primary disadvantage of the dual corridor arrangement is the additional area required for the same amount of functional net space.

Elevators: Animal facilities should be confined to a single floor at grade level. If a multilevel design or location above or below ground is unavoidable, then separate, dedicated elevators for clean and soiled material located in a single bay is desirable. The elevator used for transporting clean material should be located near the clean side of the cage wash area while the elevator used for transporting soiled material should be in close proximity to the soiled side.

SPACE DESCRIPTIONS

Vivariums in General: Animal facilities should be physically separated from research laboratories by barriers such as entry locks, corridors or floors, with accessibility provided through controlled and limited points of entry for security. The space requirements for vivariums vary greatly and are dependent on the specific use of the facility, the type of animals housed, the number of investigators utilizing the facility and methods of processing cages, racks and supplies. To protect the health status of the animals and for security reasons, animals will not leave the vivarium; therefore, laboratories specifically dedicated to animal research must be provided in the vivarium.

Vivarium Administration and Ancillary Space

Administrative offices should be located near the vivarium entrance used by personnel (internal entrance if connected to a laboratory). This places the supervisor of the vivarium in a position to observe the movement of personnel and equipment into or out of the facility. From this position visitors may have access to the administrative area without going through, or entering, the animal housing and support areas.

Clustering the administrative offices; lockers, toilets, and showers; break area; surgical suite; and radiographic suite provides the opportunity for oversight by the vivarium staff and administration, convenience for the users, and isolation of the animals from areas of potential contamination.

Office Layout Considerations: Systems furniture should be used in the offices. Private offices should be provided for the branch chief and veterinarians, and clerical should be in open offices with systems furnishings.
Conference Rooms: Small conference rooms with a capacity of 8 to 10 persons should be provided for formal and informal meetings of staff.

Break Areas: Break areas are lounges and informal gathering space for the vivarium staff. The break area should be located within the vicinity of the administrative area, and it should have a comfortable atmosphere, equipped with chairs, tables, book cases, counters, microwave ovens, vending machines, etc.

Locker, Toilet and Shower Rooms: Locker, toilet and shower rooms should be provided at the entrance to the animal holding areas for gowning and degowning. The locker room should be equipped with individual full length lockers for each staff person.

Animal Surgery

Functional areas for animal surgery should include a separate surgical support area, a preparation area, the operating room(s) and an area for intensive care and supportive treatment for the animals. The surgical suite should be located away from high traffic corridors and potential sources of contamination, such as cage wash, necropsy, and waste storage. Animals should enter the surgical suite from a surgical preparation area, while surgeons and staff should enter through the surgical scrub and gown room.

Unless separate locker facilities are provided in the surgical suite, the lockers, lounge, toilets, and showers for the vivarium staff should be located in the vicinity of the surgical suite. Surgery for small animals such as rodents should be conducted in the procedure room using a down draft-table.

Animal Surgical Preparation Room: This room will provide space for holding and preparing the subject animal for surgery. It should have direct access to the operating room, the corridor and the scrub room. The preparation room will be equipped with a procedure table, storage cabinet, stainless steel counter, and sink with wall cabinets.

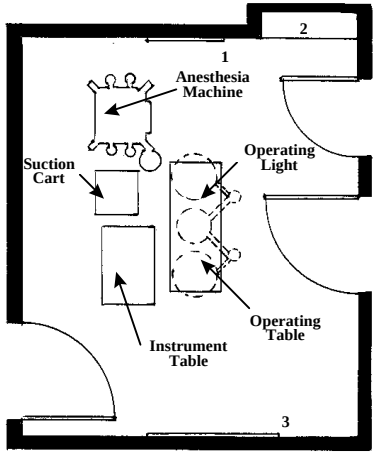
Operating Room: This area will provide space for surgical procedures on animals. Survival and terminal (non-survival) operating rooms should be designed the same, and they can be used interchangeably. (Survival surgery on rodents does not require a special facility but should be performed using aseptic procedures to prevent clinical infections). The operating rooms should have direct access to the animal surgical preparation room, the scrub room and the surgical work and supply room. The operating room will be equipped with an operating table, portable anesthesia machine, instrument table, suction cart, isolated power unit, major surgical light, medical gas dispenser, gas scavenging device, x-ray illuminator, special monitoring equipment, and dry wipe board.

Scrub and Gown Room: This room will provide space for surgical personnel to clean up and gown. The room must have direct access to the operating room and the animal surgical preparation room. The room will be equipped with a surgeon's scrub sink, disposable scrub brush dispenser, forced-air hand dryer, casework, and cabinets.

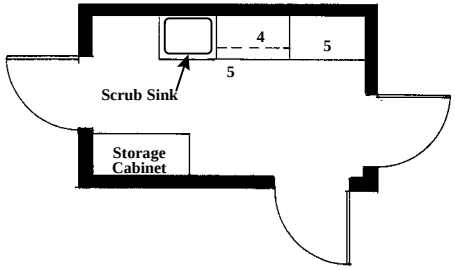
Surgical Work and Supply Room: This room must have direct access to the operating room and the corridor. It will be equipped with casework, sink, cabinets, instrument washer, and sterilizer.

Post Operative Intensive Care (Recovery) Room: This area will provide space for animals recovering from surgery. The recovery room will be equipped with a cage or a rack, stainless steel counter with sink and a wall cabinet.

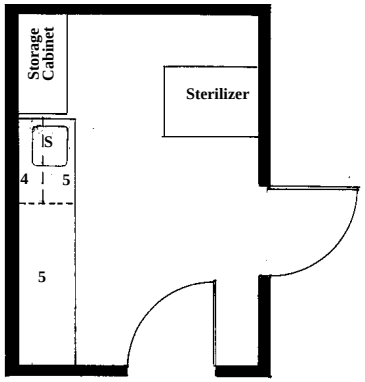
Locker Room: The locker room should provide space for surgical personnel to change before and after surgery. Lockers should be provided for short-term storage of personnel items.



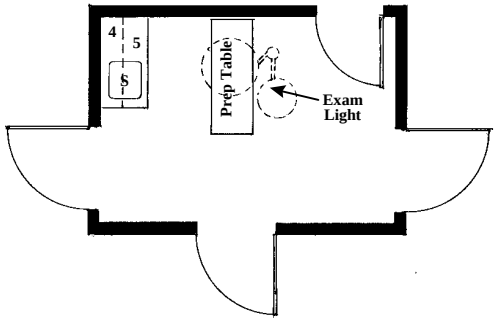
Operating Room



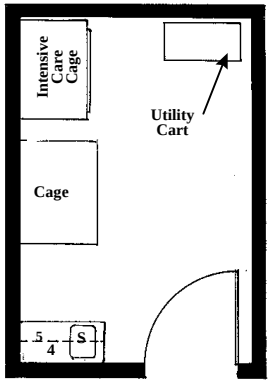
Scrub and Gown Room



Surgical Work Room and Supply



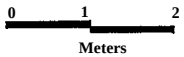
Animal Surgical Preparation Room



Post Operative and Intensive Care Room

Legend

1. X-ray Illuminator
2. Isolated Power Unit
3. Dry Wipe Board
4. Wall Cabinet
5. Under the Counter Cabinet



Animal Surgery

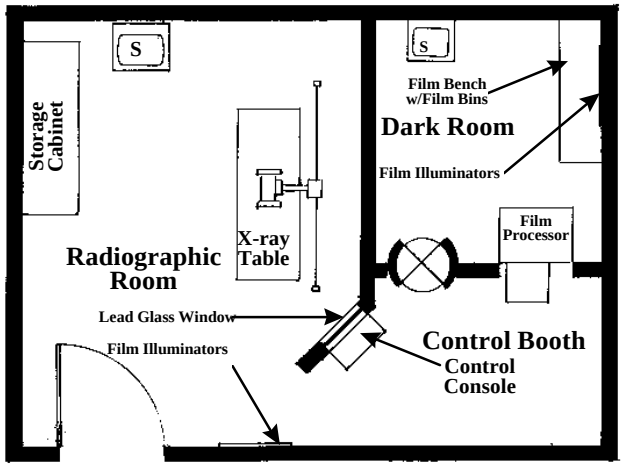
Radiographic Suite

The radiographic suite, will consists of a dark room, control booth, and radiographic room. The radiographic suite should be located conveniently to the surgical suite.

Dark Room: The dark room should provide space for developing x-ray film. It will house an automatic film processor, sink, film bench and loading bins, counter top and wall mounted film illuminators. The dark room must be equipped with a light proof door and a warning sign.

Control Booth: The control booth will provide space for personnel to control the x-ray unit.

Radiographic Room: The radiographic room will provide space for x-raying animal subjects. It will house a radiographic and fluoroscopic x-ray unit with table, wall mounted film illuminators, lavatory and wall-mounted storage cabinet.



Radiographic Suite

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Meters

Animal Receiving and Examination

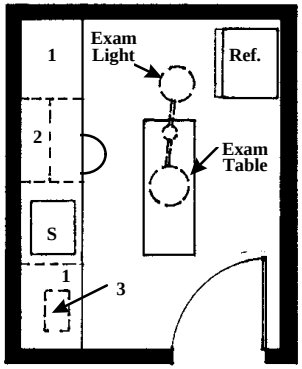
Animal Receiving and Examination Room: All incoming animals will be examined prior to entering the quarantine area. The space shall be equipped with an exam table and ceiling-mounted exam light.

Quarantine Areas: All incoming animals will be quarantined prior to entering the animal holding areas. This area will be divided into self-contained cubicles. Each cubical will have its own exhaust, watering and waste systems.

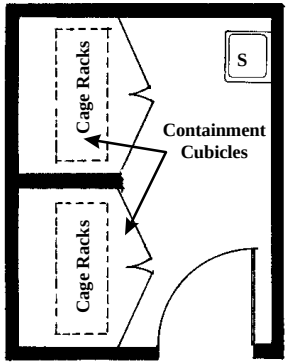
Diagnostic Laboratory: Diagnostic laboratory services supplement physical examination and facilitates diagnosis of diseases. The services may include gross and microscopic pathology, clinical pathology, hematology, microbiology, clinical chemistry, and other appropriate laboratory procedures. The space should be equipped with corrosion resistant stainless steel counter tops with an integral sink, and casework. Outlets for gas, air and vacuum should be provided.

Animal Treatment Room: This is a room for the veterinarian to treat sick and injured animals. The space should be equipped with an exam table, exam light, refrigerator, sink and casework.

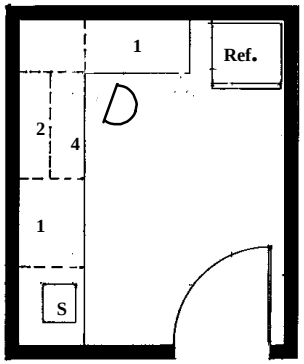
Air Locks: Provide air locks isolating the animal receiving and examination areas to prevent contamination of animal housing and clean areas.



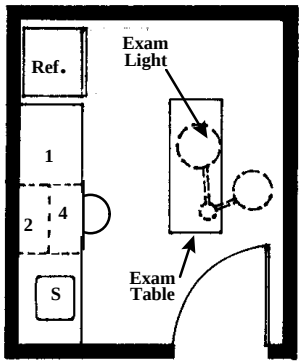
Animal Receiving and Examination Room



Quarantine Room



Diagnostic Laboratory



Animal Treatment Room

1. Under the Counter Cabinet
2. Wall Cabinet
3. Counter Mounted Weighing Scale
4. Work Surface w/ Pedestal Drawers

0 1 2
Meters

Animal Housing

The caging or housing system should be designed to facilitate animal well-being, meet research requirements, and minimize extraneous influences on experiments. The housing system should:

provide adequate space that permits freedom of movement and normal postural adjustments, a comfortable environment and provide a resting place appropriate to the species;

provide an escape-proof enclosure that confines animals safely;

provide easy access to food and water;

provide adequate ventilation;

meet the biological needs of the animals, e.g., maintenance of body temperature, urination, defecation, and, if appropriate, reproduction;

avoid unnecessary physical restraint; and

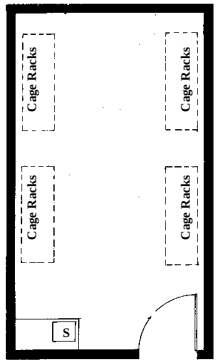
protect the animals from known hazards.

Animal Room (Small Animal Conventional Housing): Small animal rooms will house mice, rats, hamsters, guinea pigs, and rabbits. Different species must be held in separate rooms. Space should be provided for racks with a separate ante room that can be used for procedures. Ventilating racks are also used to house rodents and to provide separation of diseased status animals at the rack or cage level. Each rack should provide automatic water for the animals. Each animal room should have at least one floor drain.

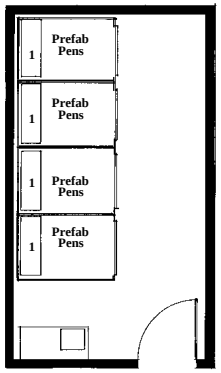
Animal Room (Large Animal Conventional Housing): The large animal rooms will house cats, non-human primates, dogs, and farm animals. Space should be provided for caging with a separate ante room that could be used for preparation and tissue samples. Each cage should provide automatic water for the animals. Each animal room should be equipped with trench floor drains. Dogs should be provided with runs if they are to be held for a long period of time. Large animal rooms may be noisy; therefore, they should be distant from quieter areas such as small animal rooms, administrative offices and the break area.

Animal Room (Cubicle Housing) Cubicles are compartments within a room which offer the advantage of isolating small segments of the animal population within a room and permit housing multiple species in a single room, using space efficiently. They are particularly useful for the quarantine of incoming animals. Cubicles may preclude the need for a separate quarantine room for small animals. Cubicles are useful in the containment of hazardous substances used in animal studies, provide an added degree of security against mix-ups for the user, and reduce odors and allergens. Cubicles can be prefabricated units that preclude the need to construct masonry structures, and they can be readily disassembled to convert the room to other uses. Each cubicle will have its own exhaust, watering and waste systems. A higher level of protection is attained through the provision of individual air supply and exhaust in each cubicle. The air may pass through a HEPA (High Efficiency Particle Air) filter at the supply end, the exhaust end or both.

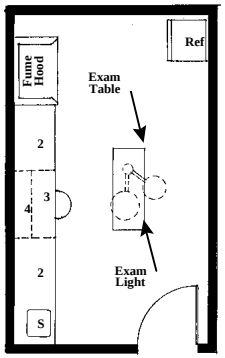
Procedure Room The procedure room is essentially a laboratory equipped with a fume hood, stainless steel counters with down draft tables, and wall cabinets. This space is provided for the investigator to conduct research on animals without taking the animals out of the vivarium. Procedure rooms should be placed near rooms used for housing small animals.



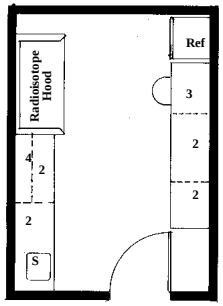
Small Animal Housing



Large Animal Housing



Standard Procedure Room



Radioisotope/Chemical Procedure Room

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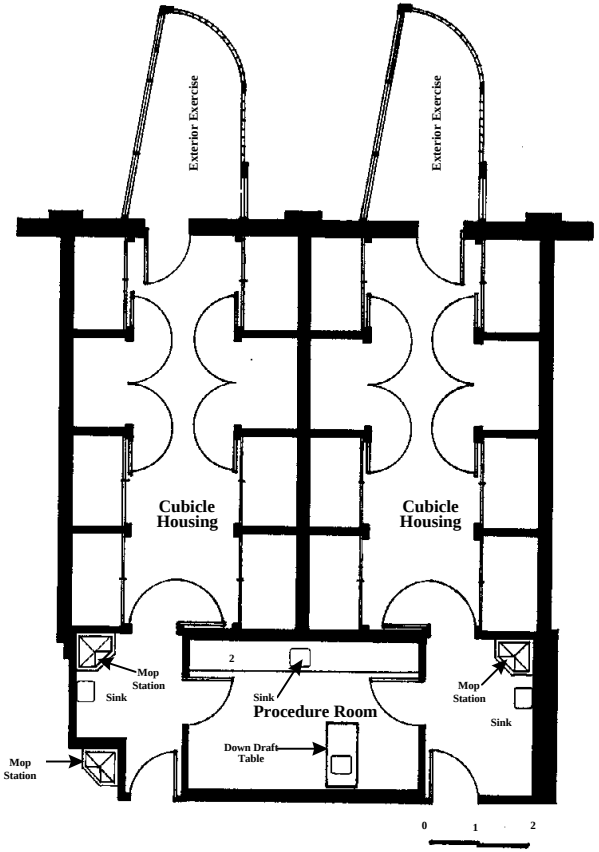
Meters



Cubicle Housing for Primates with Procedure Room

Proposed Bldg. 124, Poolesvile, MD - TKLP Architect

1. Resting Boards
2. Under the Counter Cabinets
3. Desk
4. Wall Cabinets

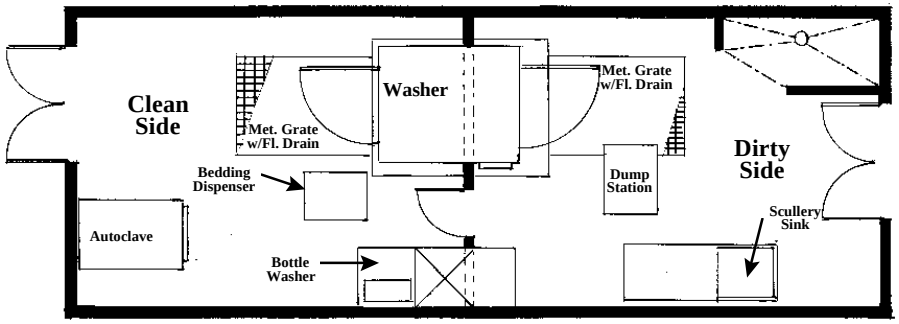
Cage Wash Area

Cage Wash Room: The cage wash is at the core of a vivarium, and there are three types of cage washers: cabinet style, cage and rack type, and the tunnel type. The cabinet style washers are essentially oversized glass washers. Cage and rack washers feature a chamber of sufficient size to accommodate one or more cage racks or large cages. (Cage and rack washers should be placed in a pit to eliminate the need for ramps, which are considered safety hazards.) The tunnel washer transports the cages on a continuously moving conveyer through a pre-rinse, detergent wash, rinse, final freshwater rinse, and drying sequence. These units are suitable for sanitizing water bottles, small cages, and a variety of other small equipment items. The cage and rack style washer should be provided for small facilities. Large vivarium facilities should be equipped with both a cage and rack type washer and a tunnel washer.

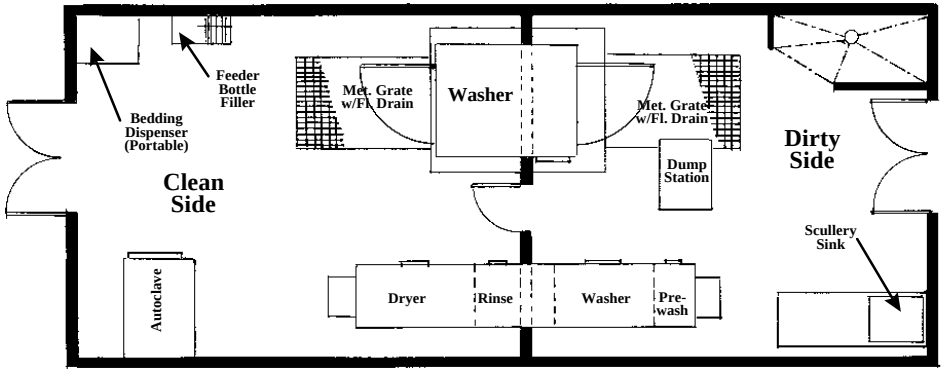
The cage wash area should be divided into two areas, a "dirty side" and a "clean side". Regardless of the washer type, cages should move in a single direction, entering through the dirty side and exiting through the clean side. The dirty side of the cage wash area should be equipped with a scullery sink, dump station, and a pre-wash stall. The clean side of the cage wash area is equipped with an autoclave, bedding dispenser, and feeder bottle filler. The cage wash should be convenient to animal rooms but distant from offices and personnel areas.

Clean Cage Storage Room: This area will provide space for the storage of clean cages and racks.

Feed and Bedding Storage: This area will provide space for bulk storage of feed and bedding.



Cage Wash Room



Cage Wash Room with Tunnel Washer

0 1 2
Meters

Vivarium Support

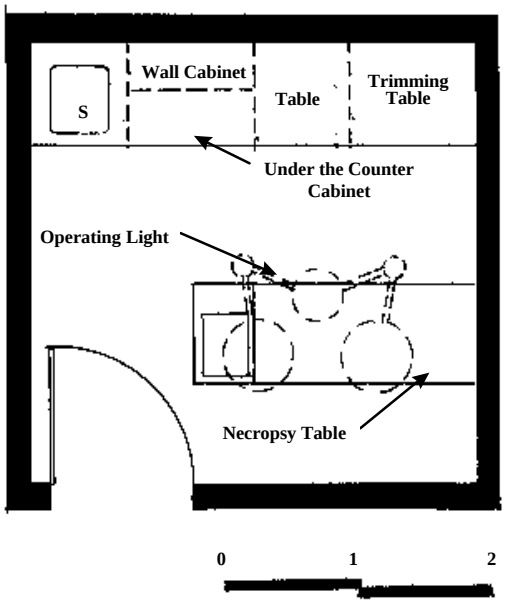
Necropsy: Necropsy will provide space for examining deceased animals. It will be equipped with an exam table and stainless steel counter, trimming table, under the counter cabinets and sink with wall cabinets. An adjacent freezer for carcass storage should be provided.

Cold Room: This area will provide space for carcass storage.

Equipment Storage: This area will provide space for shelves to store equipment.

Materials Handling

Shipping and Receiving: Separate clean and soiled docks are desirable, and both should be isolated from public view. The docks should be used mainly for the vivarium to prevent contamination of supplies destined for other facilities in some buildings such as laboratories. Waste from other areas such as laboratories must not pass through the vivarium. Animals and supplies should be delivered to a dedicated "clean" receiving dock. From the clean dock, animals are transported to a receiving and examination room. After examination, animals are transferred from shipping containers to clean cages and taken either to a quarantine room or to an animal room equipped with a containment housing system. The dirty side of the cage wash, necropsy room, and cold storage (carcass storage) should be readily accessible to the dedicated "soil (dirty) dock" area.



Necropsy Room

SPACE REQUIREMENTS

Minimum Space Recommendations for Small Laboratory Animals

Animals	Weight (g)	Housing	Area (cm^2)	Hgt. (mm)	Remarks
Mice	<10	Cage	38.71	127.0	
	10 - 15		51.62		
	15 - 25		77.42		
	>25		96.78		
Rats	<100	Cage	109.68	177.8	
	100-200		148.40		
	200-300		187.11		
	300-400		258.08		
	400-500		387.12		
	>500		451.64		
Hamsters	<60	Cage	64.52	152.4	Space recommendations are comparable to current regulations of the Animal Welfare Act. Mothers w/litters require more space (CFR.1984.a)
	60 - 80		83.88		
	80 - 100		103.23		
	>100		122.59		
Guinea Pigs	350	Cage	387.12	177.8	Space recommendations are comparable to current regulations of the Animal Welfare Act. Mothers w/litters require more space (CFR.1984.a)
	>350		651.65		
Rabbits	<2 kg	Cage	1400	355.6	Space recommendations are comparable to current regulations of the Animal Welfare Act. Mothers w/litters require more space (CFR.1984.a)
	2 - 4		2800		
	4 - 5.4		3700		
	>5.4		4600		

Minimum Space Recommendations for Large Laboratory Animals (Cats, Dogs and Non-human Primates)

Animals	Weight (kg)	Housing	Area (m^2)	Hgt. (mm)	Remarks
Cats	4	Cage	0.28	609.6	
	.>4		0.37		
Dogs	<15	Run	0.74		These recommendation may require modification according to the body conformation of individual animals and breeds. Some dogs, especially those toward the upper limits of ea. wt. range, may require additional space or cage hgt. to insure compliance with the Animal Welfare Act (AWA). The AWA mandate that the hgt. of ea. cage be sufficient to allow the dog to stand in a comfortable position and the min. m^2 of floor space = ▦ ^{2} of length of the dog in cm as measured from tip of nose to base of the tail + 15 cm, expressed in m^2.
	15-30		1.12		
	>30		2.23		
	<15	Cage	0.74	812.8	
	15-30		1.12	914.4	
	>30		2.23		
Non-Human Primates		Cage			The designated groups are based on approx. sizes of various non-human primates species used in biomedical research.
Group 1	<1		0.15	508.0	Group 1-marmosets, tamarinds, infants of various species
Group 2	1 - 3		0.28	762.0	Group 2-capuchins, squirrel monkeys, and similar species
Group 3	3 - 10		0.40	762.0	Group 3-macaques and African species
Group 4	10 - 15		0.56	812.8	Group 4-male macaques and large African species
Group 5	15 - 25		0.74	914.4	Group 5-baboons and nonbrachiating species larger than 15 kg
Group 6	>25		2.33	2 133.6	Group 6-great apes and brachiating species The minimum height for runs used to house non-human primates should be 1 800 mm. For chimpanzees and brachiating species (orangutans, gibbons, spider monkeys, and woolly monkeys), the minimum cage height should be such that the animals can, when fully extended, swing from the cage ceiling w/o having their feet touch the floor.

Minimum Space Recommendations for Large Laboratory Animals (Sheep, Goats and Swine)

Animals	Weight (g)	Housing	Area (m^2)	Hgt. (mm)	Remarks
Sheep & Goats		Pen			
1-4/pen					
	<25		0.93		
	25 - 50		1.39		
	>50		1.86		
5/pen					
	<25		0.79		
	25 - 50		1.16		
	>50		1.58		
> 5/pen					
	<25		0.70		
	25 - 50		1.05		
	>50		1.39		
Swine		Pen			
1-4/pen					
	<25		0.56		
	25 - 50		1.11		
	50 - 100		2.23		
	100 - 200		4.46		
	>200		5.57		
5/pen	<25		0.56		
	25 - 50		0.93		
	50 - 100		0.86		
	100 - 200		3.72		
	>200		4.83		
> 5/pen	<25		0.56		
	25 - 50		0.84		
	50 - 100		1.67		
	100 - 200		3.34		
	>200		4.46		

Minimum Space Recommendations for Large Laboratory Animals (Cattle, Horses and Ponies

Animals	Weight (g)	Housing	Area (m^2)	Hgt. (mm)	Remarks
Cattle		Stanchion			
Stanchion	<350		1.49		
	350-450		1.67		
	450-550		2.04		
	550-650		2.23		
	>650		2.51		
1-4/pen	<75	Pen	2.23		
	75-200		4.46		
	200-350		6.69		
	350-500		8.92		
	500-650		11.52		
	>650		13.38		
5/pen	<75		1.86		
	75-200		3.72		
	200-350		5.57		
	350-500		7.43		
	500-650		9.75		
	>650		11.15		
> 5/pen	<75		1.67		
	75-200		3.34		
	200-350		5.02		
	350-500		6.69		
	500-650		8.64		
	>650		10.03		
Horses		Tie Stall	4.09		
		Pen	13.38		
Ponies		Pen	6.69		
1-4/Pen			5.57		
>4/Pen	200		6.69		

Minimum Space Recommendations for Laboratory Birds

Birds	Weight (g)	Housing	Area (cm^2)	Hgt. (mm)	Remarks
Pigeons		Cage	0.074		Sufficient headroom must be provided for birds to stand erect.
Quail		Cage	0.023		
Chickens	<0.25	Cage	0.023		
	0.25-0.5		0.046		
	0.5-1.5		0.093		
	1.5-3		0.186		
	>3		0.285		

Summary Space Schedule:

Administrative, Ancillary & Miscellaneous Space

Space Name	M^2/ Person	Equipment/Furniture and Requirements	Hgt in mm	Remarks
Branch Chief	15.0	Work surfaces w/binder bins, convergent work surfaces, lateral files, tack boards, & white boards.	2 400	
Veterinarian Office	12.0	Work surfaces w/binder bins, convergent work surfaces, lateral files, tack boards, & white boards.	2 400	
Secretary	8.0	Counter, work surfaces w/binder bins & lateral files.	2 400	
Clerical	8.0	Work surfaces w/binder bins & lateral files.	2 400	
Locker, Toilet & Shower Room	Fixtures and equipment determines the size	Water closet, shower, lavatories w/mirrors, lockers, and benches.	2 400	Provide separate locker /toilet shower for male and female employees
Conference	0.2	Conference table, chairs A/V equipment, white boards, etc.	2 400	
Break Areas		Vending machines, counters, tables w/chairs, refrigerator, microwave oven, drinking fountain, and lounge furniture.	2 400	
Building Engineer's Office	10.0	Work surfaces, w/binder bins & lateral files.	2 400	

Surgery Suite

Space Name	M^2	Equipment/Furniture and Requirements	Hgt in (mm)	Remarks
Animal Surgical Preparation Room	11.20	Procedure table, storage cabinet, counter and sink w/wall cabinets.	3 000	Direct access to operating room, scrub room and corridor.
Operating Room	18.80	Operating table, portable anesthesia machine, instrument table, suction cart, isolated power unit, major surgical light, medical gas dispenser, gas scavenging device, x-ray illuminator, special monitoring equipment and white board.	3 000	Direct access to animal surgical preparation room, scrub room and the surgical work and supply room.
Scrub and Gown Room	8.75	Surgeon's scrub sink, case work, and storage cabinets.	2 400	Direct access to animal surgical preparation room and operating room.
Locker Room	0.56	Full length lockers and benches	2 400	
Surgical Work and Supply Room	13.50	Case work, sink, instrument washer, and sterilizer.	2 400	Direct access to operating room and corridor.
Post Operative Intensive Care (Recovery) Room	11.20	Cage or rack, counter w/sink and wall cabinet.	2 400	

Radiographic Suite

Space Name	M^2	Equipment/Furniture and Requirements	Hgt in (mm)	Remarks
Dark Room	5.76	Automatic film processor, sink, film bench and loading bins, counter top, and wall mounted film illuminators.	2 400	Must be equipped w/light proof door.
Radiographic Room	22.95	Radiographic and fluoroscopic x-ray unit w/table, wall mounted film illuminators, lavatory and wall mounted storage cabinet.	3 000	Provide for separate control booth.

Animal Receiving and Examination

Space Name	M^2	Equipment/Furniture and Requirements	Hgt in (mm)	Remarks
Animal Receiving and Examination Room	11.20	Countertop, stainless steel (s/s), raised rim, w/integral sink and splashbacks, casework, s/s exam table, refrigerator (domestic type), electronic animal weighing scale, and exam light.	3 000	Provide hose bib, floor drain, & retractable ceiling cord. The following equipment is only applicable when more than the minimum net area (11 m^2) is provided: bath tub & floor mounted electron animal scale.
Quarantine Room	11.40	Self contained cubicles.	3 000	Provide automatic watering system, hose bib, & floor drain.
Animal Treatment Room	11.47	Countertop, s/s, raised rim, w/integral sink and splashbacks, casework, s/s exam table, refrigerator (domestic type), and exam light.	3 000	
Diagnostic Laboratory	12.96	Countertop, s/s, raised rim, w/integral sink and splashbacks, casework, and refrigerator (domestic type).	3 000	

Animal Housing

Space Name	M^2	Equipment/Furniture and Requirements	Hgt in (mm)	Remarks
Animal Room (Small Animal Conventional Housing) Mice, rats, hamsters, guinea pigs, and rabbits	Number of animals determines the space	Cages or racks.	3 000	Provide combination faucet w/hose bib, and automatic watering system w/quick disconnects and floor drain.
Animal Room (Large Animal Conventional Housing) cats, non-human primates, dogs, and farm animals	Number of animals determines the space	Cages or pens.	*3 000	Provide combination faucet w/hose bib, and automatic watering system w/quick disconnects and trench drains. * Non-human primates may require additional height for swinging and other enrichment activities. Thick lexan panels in lieu of traditional caging should be considered in some non-human primate for enrichment and socialization.
Animal Room (Cubicle Housing)	Number of animals determines the size		3 000	
Procedure Room	22.68	Fume hood, BSC, counters, sink, exam table, refrigerator, wall cabinet, and under counter cabinets.	3 000	

Cage Wash

Space Name	M^2	Equipment/Furniture and Requirements	Hgt in (mm)	Remarks
Cage Wash Room	Equipment determines the size	Cage rack washer,, autoclave, bedding dispenser, acid neutralizing equipment, feeder bottle filler, scullery sink, bottle washer, and dump station.	3 000	Provide a pre-wash stall. Tunnel washer may be provided in a larger vivarium facility.
Clean Cage Storage Room	37.72		3 000	
Feed and Bedding Storage	11.18	Pallets and refrigerator.	3 000	

Vivarium Support

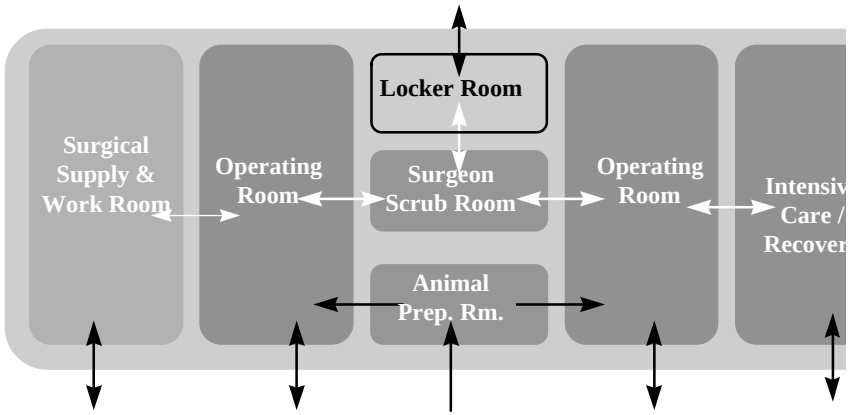
Space Name	M^2	Equipment/Furniture and Requirements	Hgt in (mm)	Remarks
Necropsy	11.88	Necropsy table, counter, sink, base, trimming table and wall cabinets.	3 000	
Cold Room	Unit determines the size.	Prefabricated unit w/shelves.		
MPW, Carcass and Waste Storage	11.07	Sink, freezer chest.	3 000	
Equipment Storage	9.28	Shelving.	3 000	

Gross Area Allowance

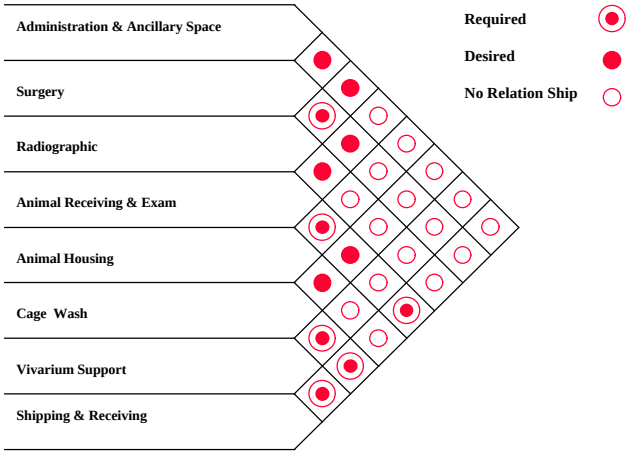
The gross building area , which includes circulation building core, wall thickness, and utility space will exceed the net assignable area by a grossing factor.

Grossing Factors: Grossing factors are important in developing budgets and determining planning efficiencies. Grossing factors for a vivarium can range from 2.0 to 2.2+ based on internal circulation patterns, interior partitions, utility distribution, mechanical equipment configuration, etc.

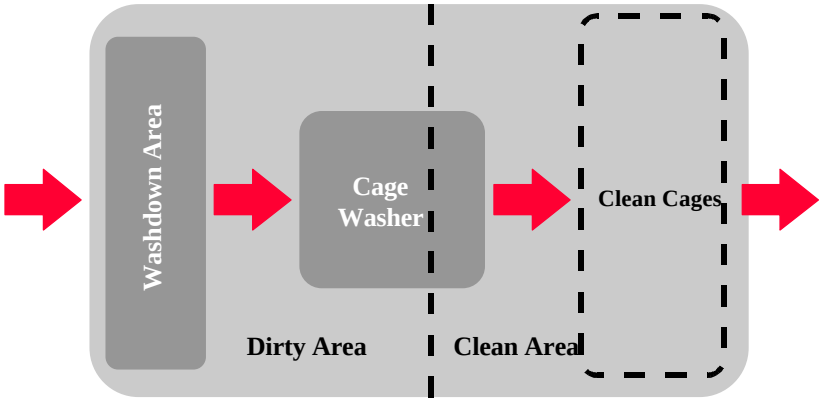
FUNCTIONAL RELATIONSHIPS



Surgery Suite Functional Relationship Diagram



Functional Relationship Matrix



Cage Wash Functional Relationship Diagram