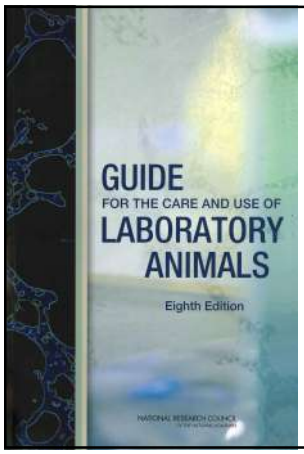


Chapter 5

Physical Plant

Facility General Considerations

Design/size is dependent on:

- scope of institutional research activities
- species of animals to be housed
- physical relationship to the rest of the institution
- geographic location
- facilities should be designed to accommodate changes in use over time - flexibility

General considerations

Location

- Separation of animal and human areas

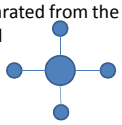
- Animal areas near but separate for research laboratories
- Consider security – floor of building, access doors
- Minimize exposure to animals in the research area and during transport to and from the area.

General considerations

Centralization vs Decentralization (physical)

- Centralized - support, care, and use areas are adjacent to the animal housing space.

- Decentralized - animal housing and use occur in space that is not solely dedicated to animal care or support or is physically separated from the support areas and animal care personnel



General considerations

Centralization vs Decentralization

- Centralization
  - often reduces operating costs
  - more efficient flow of animal care supplies, equipment, and personnel
  - more efficient use of environmental controls
  - less duplication of support services
  - reduces the needs for transporting animals between housing and study sites
  - minimize the risks of transport stress and exposure to disease agents
  - greater security by providing the opportunity to control facility access
  - increases the ease of monitoring staff and animals

General considerations

Functional Areas

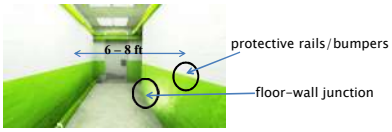
- Required
  - animal housing, care, and sanitation
  - receipt, quarantine, separation, and/or rederivation of animals
  - separation of species or isolation of individual projects
  - storage
- Other possible areas
  - specialized laboratories – surgery, imaging etc.
  - containment facilities
  - barrier facilities
  - others to meet institutional research needs

General considerations

Construction guidelines

Corridors

- 6 – 8 feet to accommodate equipment
- floor-wall junctions designed to facilitate cleaning
- protective rails or bumpers recommended and sealed to prevent vermin



General considerations

Construction guidelines

Corridors

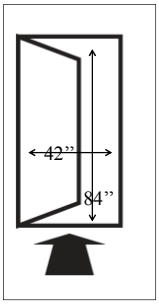
- double-door entry vestibules or other noise traps for areas with noisy animals or to prevent escape - NHPs
- fire alarms, fire extinguishers, and telephones should be recessed, installed high enough or shielded by protective guards to prevent damage from the movement of large equipment.

General considerations

Construction guidelines

Doors

- large enough (approximately 42 × 84 in.) to allow easy passage of racks and equipment
- doors/frames should be appropriately sealed to prevent vermin entry or harborage
- coated with materials that resist corrosion.
- for safety, doors should open into animal rooms; if it is necessary that they open toward a corridor, there should be a recessed vestibule.



General considerations

Construction guidelines

Doors

- self-closing with recessed or shielded handles, sweeps, and kickplates and other protective hardware
- hospital or terminated stops are useful to aid in cleaning

General considerations

Construction guidelines

Windows

- Not recommended
  - Security risk
  - Lack of control of photoperiod
  - May affect room temperature control
  - Can provide enrichment for NHPs

Floors

- moisture resistant
- nonabsorbent
- impact resistant
- relatively smooth
- textured surfaces may be required in some high-moisture areas and for some species

General considerations

Construction guidelines

Drainage

- floors should be sloped
- drain traps kept filled with liquid
- rapid removal of water and drying of surfaces to minimize prolonged increases in humidity
- drainpipes should be at least 4 in. (10.2 cm) in diameter
- in some areas, such as dog kennels and agricultural animal facilities, larger drainpipes (>6 in.) are recommended
- not essential in all animal rooms, i.e. rodent rooms
- including floor drains that can be capped allows animal room flexibility

General considerations

Construction guidelines

Walls and ceilings

- smooth
- moisture resistant
- nonabsorbent
- impact resistant
- free of cracks, unsealed utility penetrations, and imperfect junctions with doors, ceilings, floors, walls, and corners

General considerations

Construction guidelines

HVAC

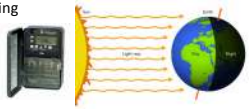
- Essential for environmental control and pressurization
- Design characteristics
  - reliability
  - ease of maintenance
  - energy conservation
  - adaptability for different numbers and types of animals
  - maintain dry-bulb temperatures of ± 1° C (± 2° F)
  - maintain RH 30 – 70%; generally ± 10% of set point
  - valves controlling reheat coils should fail in the closed position
  - 100% fresh air best but if recycled air is used should have filtration 85 – 90% dust filters

General considerations

Construction guidelines

Power and lighting

- sufficient number of power outlets of suitable amperage for specialized equipment
- alternative or emergency power for emergencies → supply to maintain critical services – HVAC, ventilated caging systems, life support systems for aquatic species
- safe and appropriate lighting
- time-controlled lighting



- dual level lighting = low level for animals; higher level for husbandry

General considerations

Construction guidelines

Storage

- Adequate space for food, bedding, equipment
- Corridors are not appropriate for use for storage
- Temperature and RH control for food storage
- Refrigerated storage for carcasses and tissue waste - should be kept below 7° C (44.6° F)

General considerations

Construction guidelines

Noise

- Consider noise dampening material – concrete block or sound attenuating materials.
- Avoid equipment that generates sound in ultrasonic frequency in rodent facilities

Vibration

- Sources - mechanical equipment, electrical switches, other building components, or from remote sources via ground-borne transmission
- Sensitivity different for different species

General considerations

Construction guidelines

Facilities for sanitizing materials

- Many considerations
  - Location, access and traffic flow
  - Space for staging, waste disposal and pre-washing
  - Ease of cleaning/disinfecting area
  - Ventilation and air pressurization
  - Insulation and sound attenuation
  - Vibration
  - Personnel safety

Environmental monitoring

- Automated systems with alarms best
- Function should be monitored/verified

General considerations

Special facilities

Surgery

- Meet the needs of species used
  - rodents, aquatic species and birds – procedure rooms may be used.
  - larger species – dedicated facilities
  - surgical vs nonsurgical functions should be separate
  - consider ease of cleaning
- Functional components of aseptic surgery
  - surgical support
  - animal preparation
  - surgeon's scrub
  - operating room
  - postoperative recovery

General considerations

Special facilities

Surgery

- Surgical support area
  - Wash (large sink), sterilize (autoclave), and store instruments (cabinets)
  - Dressing area/locker room
  - Scrub sinks
- Post operative area
  - Equipped for species used

General considerations

Special facilities

Barrier facilities for mice and rats

- air locks and/or special entry procedures
- restricted entry and only with special training
- dedicated clothing/footwear
- sterile feed/bedding/water treatments
- cages autoclaved before use
- strict operating procedures
- allow only defined health status animals
- positive pressure area
- HEPA or 95% efficient filtration
- specialized caging – microisolator, IVCs, animal change stations

General considerations

Special facilities

Imaging Facilities

- consider problems of cross contamination when locating imaging equipment
- prevent human exposure when transporting animals to imaging area
- provisions for anesthesia in imaging area, gas scavenging and animal monitoring
- may require room modifications to operate safely and not affect other equipment
- may require specialized support space and highly trained personnel to operate
- cover imaging device with sanitizable material when not in use

General considerations

Special facilities

Imaging Facilities

- Considerations for MRI
  - magnetic resonance scanners location need special attention due to size
  - magnetic field and ferrous elements
  - MR scanner rooms MUST be equipped with oxygen sensors and ability to increase room ventilation during cryogen gas boil off.

General considerations

Special facilities

Gamma and X-ray machines

- most self-shielded
- very heavy require special considerations
- Gamma emitters subject to NRC regulations
- consider location based on use and source of animals and people traffic

Hazardous Waste Containment

- reduce or eliminate exposure of laboratory workers, other persons, and the outside environment to potential hazardous agents
- Accomplished through
  - Appropriate practices and equipment
  - Vaccination if appropriate
  - Proper design and operation of physical plant


Hazardous Waste Containment

Hazards

- Infectious agents → BMBL
- Agricultural pathogens → USDA
- Recombinant DNA → NIH
- Arthropod vectors → ACME (American Committee of Medical Entomology), ASTMH (American Society of Tropical Medicine and Hygiene) Arthropod Containment Guidelines
- Hazardous chemicals – NRC
- Biologic agents and toxins - threat to animal and plant health or public health and safety, and facilities in which they are used must adhere to USDA APHIS, and CDC Select Agent Regulations

Behavioral Studies

Facilities for behavioral testing of animals

- May need environment that controls auditory, visual, tactile, and olfactory stimuli
- Minimize noise and vibration →
  - construction of HVAC
  - fire alarms
  - door closures
  - equipment location
  - human traffic



- Double door entry, sound proofing floor, air pressure differential
- Locate non-disinfectable equipment away from animals and cover if not in use
- Consider housing near area to decrease transportation

Aquatics Housing

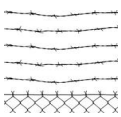
Housing features required for aquatic species

- water treatment/sterilization/filtration that may be required
- need drains but should not permit animals or hazardous materials to enter the sewer system.
- impervious walls, floors, ceiling
- slip resistant floors
- ground-fault interrupted electrical receptacles
- moisture and corrosion-resistant metallic equipment
- nontoxic and biologically inert plumbing material
- sufficient ventilation to prevent moisture buildup

Security and Access Control

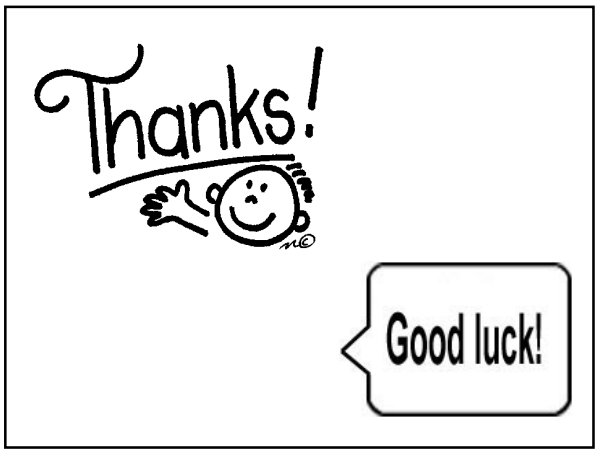
- strictly controlled and limited access to people who have a legitimate reason entering facility
- reasons for controlling access
  - Animal rights activism – domestic terrorism
  - Biosecurity
  - Hazard agents in use
  - Occupational health
- limit/monitor vehicular access/traffic
- security control measures
  - Security personnel
  - Physical barriers
  - Control devices




Final thoughts on the *Guide*

- Read the entire *Guide.*
- Information in the *Guide* is very logical.
- Do not take statements out of context or carefully consider the context.
- Remember, some topics are addressed in more than one location.
- Think performance standards … evaluate the effectiveness of procedures and programs (meeting the "intent of the Guide").
- Check other sources for more in depth guidance (e.g., references provided in the *Guide,* AAALAC FAQs, OLAW position statements, etc.)


Thanks!
Good luck!