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News to Use
Design Requirements Manual
The formulae for building state of the art biomedical research facilities.

'Design Requirements Manual (DRM) News to Use' is a monthly ORF publication featuring salient technical information that should be applied to the design of NIH biomedical research laboratories and animal facilities. NIH Project Officers, A/E's and other consultants to the NIH, who develop intramural, extramural and American Recovery and Reinvestment Act (ARRA) projects will benefit from 'News to Use'. Please address questions or comments to: ms252u@nih.gov

# Animal Research Facility Design Requirements

Most of the same design principles that apply to biomedical research laboratories also apply to animal research facilities (ARF) (see April 2010). For example, the NIH ARF is designed to a minimum of Biosafety Level 2 (BSL-2). Biosafety levels above BSL-2 meet minimum level 2 requirements plus additional safety and security requirements as defined in separate chapters of the DRM. Many additional features must be considered for an ARF. Minimum ARF requirements to meet AAALAC certification are outlined in the "Guide for the Care and Use of Laboratory Animals (Guide)." The NIH generally exceeds AAALAC requirements. During planning, it is crucial to identify the variety of species to be housed in the facility over time; the temperature and humidity range that each species can tolerate; and the degree of flexibility and adaptability required to accommodate different species. Vibration stability, noise damping, diurnal lighting, prep space, surface finishes, sealing and caulking, and ventilation, are other critical considerations in designing an ARF. Since animal facilities present some of the most challenging pest management concerns, the NIH integrated pest management (IPM) program must be incorporated into the design. The DRM provides guidance to create an ergonomic and reduced allergen environment for facility workers. For example, an operating noise level of 85 dBa should not be exceeded in the cage wash area and changing stations are used to change the bedding to keep dust levels as low as possible.

At NIH, most of the animal holding rooms are designed for small animals such as rodents or for non-human primates. The DRM contains guidance about other species that are less frequently used at NIH but may require specialized facilities. Generally, any area where animals are held for more than 24 hours is treated as holding area. Often an NIH ARF includes surgical and pathology areas, diagnostic equipment, multiple types of storage including drug and cold carcass storage.

Natural light is not used in rodent housing areas where the research often requires regulated lighting cycles. Lighting should be on emergency power and monitored at the room level independent from the method used to control the lights. Most small animals are stressed by noise so it is important to consider noise damping and acoustical isolation from animal holding rooms wherever possible.

Animal holding room modular size is based on cage rack system size which may be different than a standard laboratory module. The minimum recommended space between racks is 915 mm. The ceiling height of the animal room and doors must be carefully planned for. The height is a function of the maximum rack height including rack fans. Adequate space above the rack must be allowed for uniform airflow distribution in the room.

The ARF HVAC units are designed with N+1 redundant system arrangements or with standby equipment with capability to ensure continuous operation during equipment failure, power outages, and scheduled maintenance outages. Although it is acceptable to have a common air intake system for both animal holding and other parts of the building, the animal area exhaust system must be independent of the non-animal exhaust systems of the building. Utility connections to animal facility modules include a small sink in each small animal holding room; selection of an animal watering system; placement of weatherproof or waterproof protected electrical outlets with sufficient electrical loads to accommodate all the holding and procedure room needs. Rack systems shall be connected to the emergency power system. If a BSC or a laminar flow transfer station is required, the impact of these systems must be considered in determining the room's heat load and air circulation patterns. Consideration must be given to specific pathogen free (SPF) zones, and clean and dirty areas when planning functional adjacencies.

Cage wash rooms must be designed with a "dirty" side and a "clean" side. The dirty side may require prep or de-scale pit. The DRM provides guidance for the pit specifications. Dirty side equipment includes a bottle washer, a cage and rack washer, tunnel type washers, acid neutralization tanks, and an autoclave. The autoclave should be of sufficient size to contain full size or multiple cage racks and should be provided with "clean" steam to extend the useable life of the equipment. The clean side is equipped with a large autoclave, bedding dispenser, animal drinking water flush station, and water bottle filler. Linear space for marshalling is also required on the clean side.

An animal loading dock area shall be considered. The DRM provides detailed guidance to ensure safe and secure animal transfer into the facility.

For further information, refer to the Room Data Matrix, Appendix C-Vivarium of the DRM; the IPM program in Chapter 1 Section 1-11; animal biosafety level 3 (ABSL-3 in Chapter 2 Sections 6 and Section 3-3-10-C: Vivarium Loading Docks.

Further details on this month's topic are available on the DRM WEB site
http://orf.od.nih.gov/PoliciesAndGuidelines/BiomedicalandAnimalResearchFacilitiesDesignPoliciesandGuidelines/DesignRequirementsManualPDF.htm
Chapter 2 Section 2-4: Animal Research Facilities

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