

Physical Plant: The Foundation for Quality Research Outcomes

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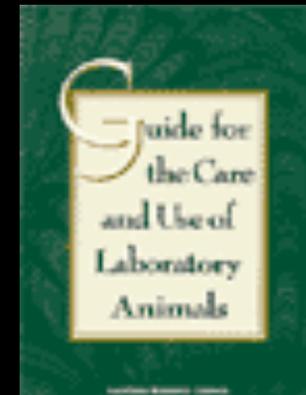
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OLAW Online IACUC Staff Seminar
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Topics To Be Covered

- Requirements vs. guidelines
- Goals of the physical plant
- Overview of physical plant findings by AAALAC
 - Issue 1: HVAC
 - Issue 2: Construction guidelines
 - Issue 3: Functional areas (surgery)
- Resources

Requirements vs. Guidelines



- Biosafety in Microbiological and Biomedical Laboratories (BMBL) – CDC-NIH
- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- *Guide for the Care and Use of Laboratory Animals* - ILAR

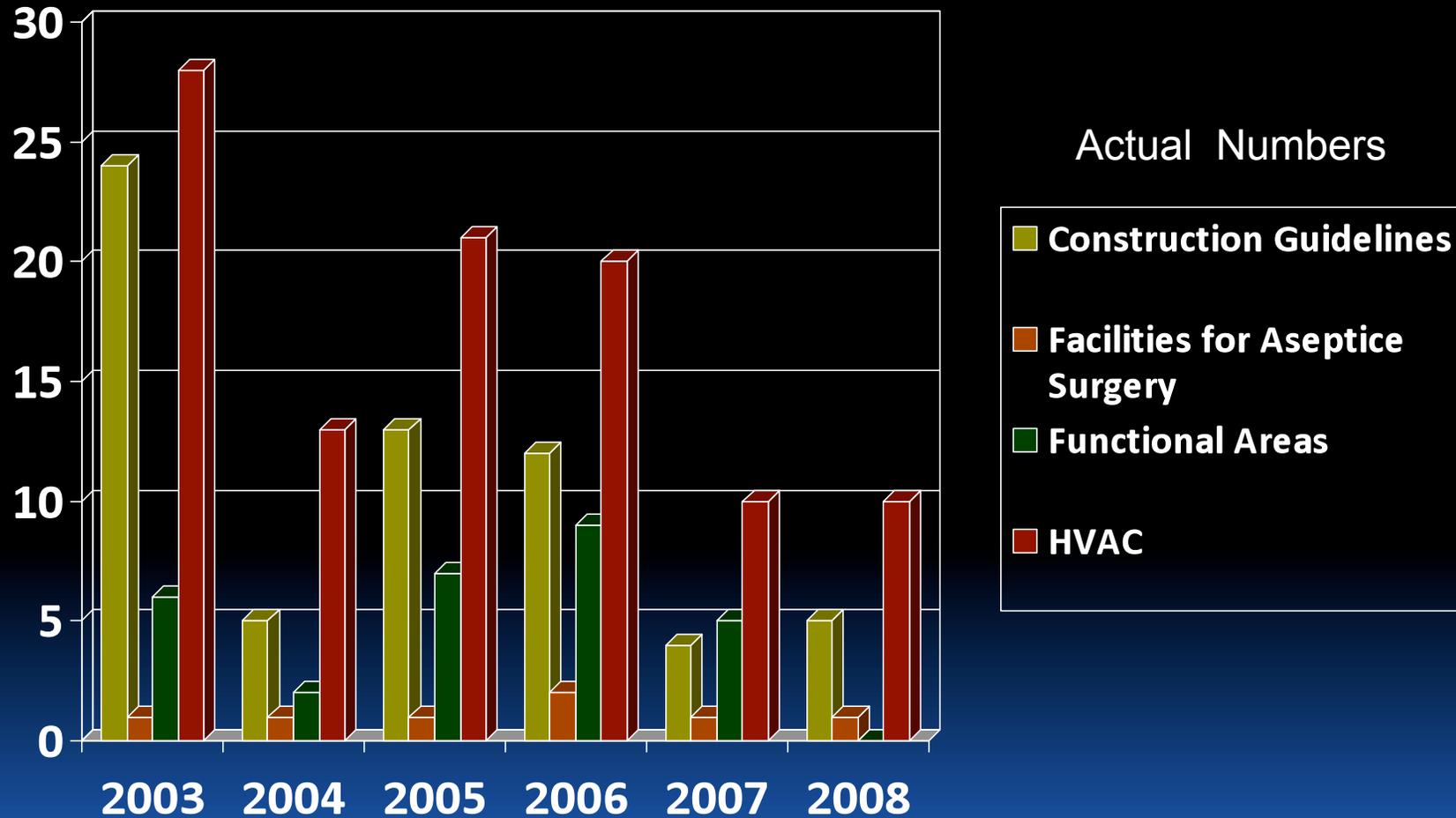


Goals of the Physical Plant

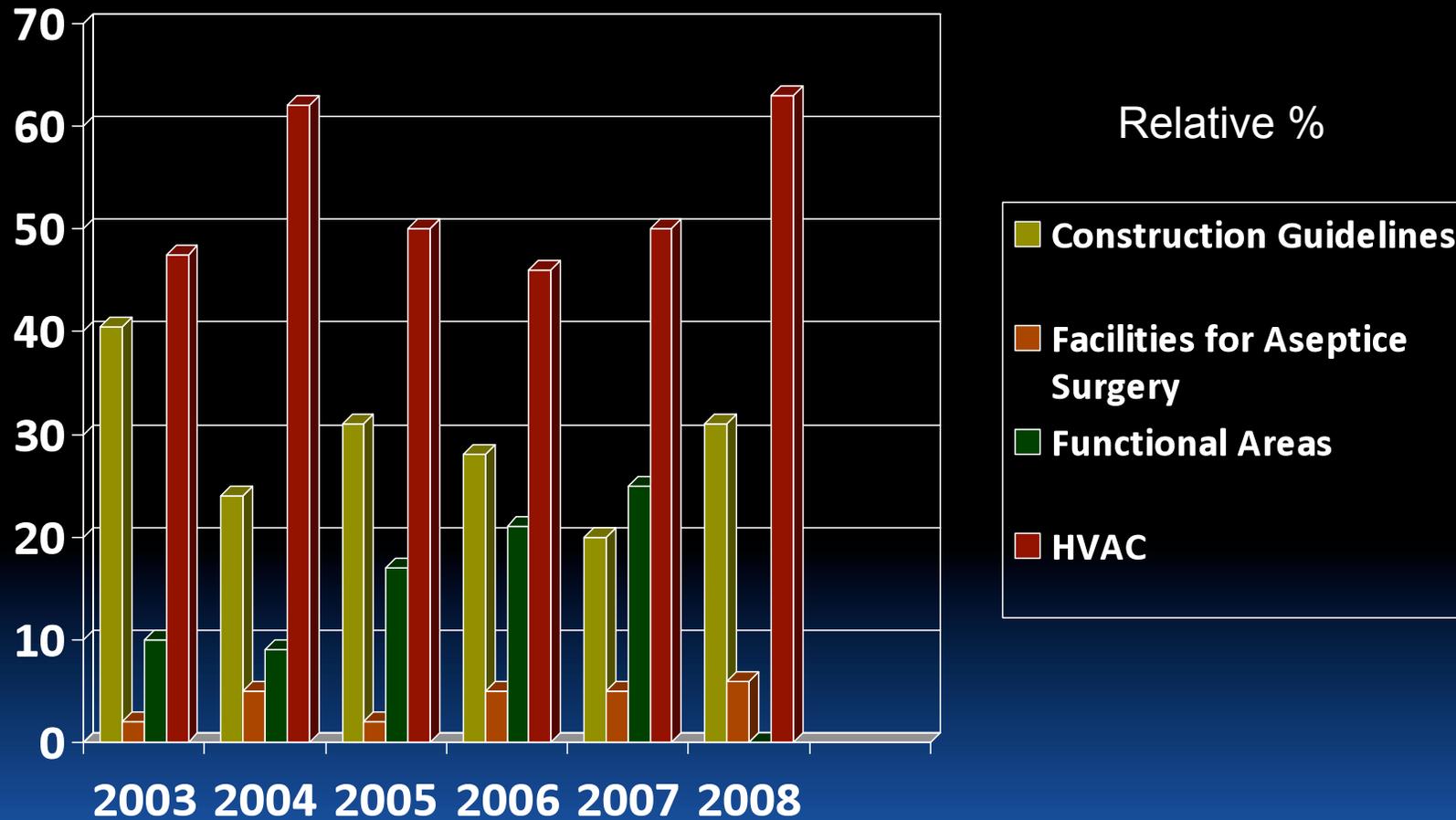
To Establish and Maintain a Vivarium that is

- Environmentally stable
- Flexible
- Accommodating
- Research supportive
- Ergonomically sound
- Occupationally safe
- Disaster preventative

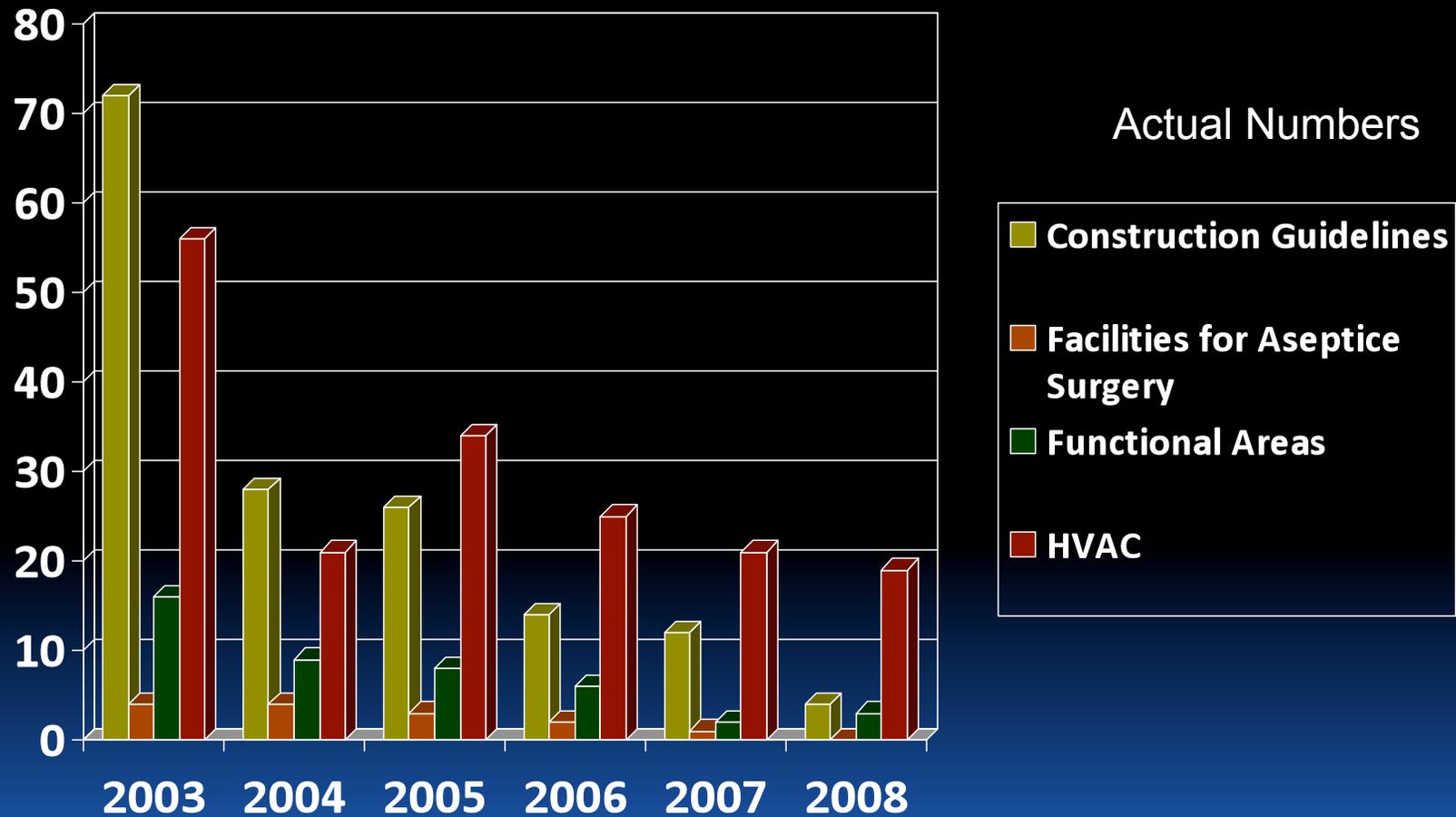
AAALAC Mandatories (2003-2008)



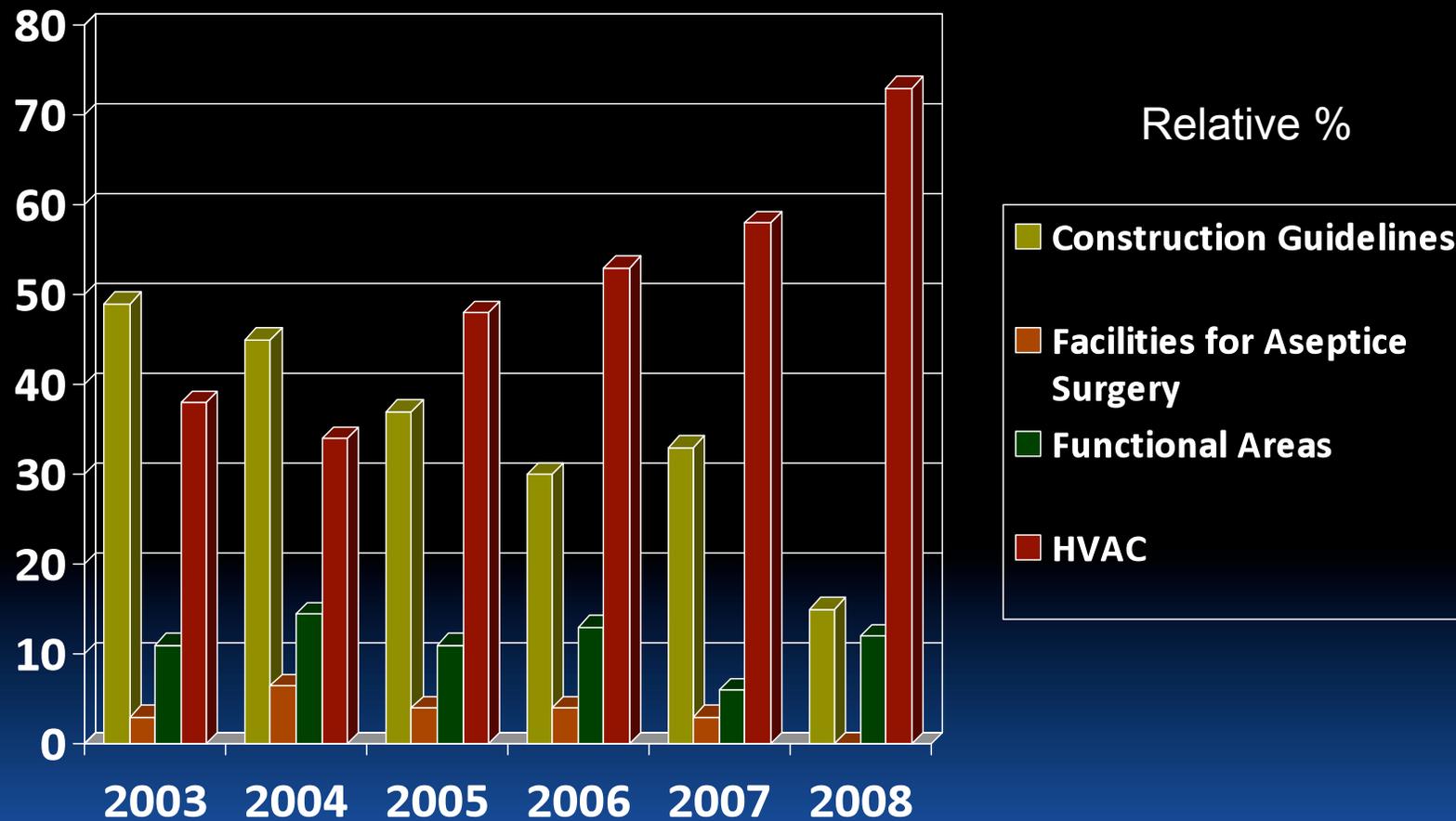
AAALAC Mandatories (2003-2008)



AAALAC Suggestions (2003-2008)



AAALAC Suggestions (2003-2008)



AAALAC Conclusions (Physical Plant)

Order of the Most Common Facility Deficiencies:

- Heating, Ventilation and Air Conditioning (HVAC)
- Construction Guidelines
- Functional Areas (facilities for aseptic surgery)

HVAC (Heating, Ventilation & Air Conditioning)

Frequency Order of Specific Issues

- HVAC not capable of maintaining temperature according to Guide recommendations
- Inappropriate relative air pressure differential
- HVAC performance data not provided or incomplete
- Inadequate air exchange
- Unable to maintain humidity according to Guide recommendations
- No monitoring of HVAC system performance

HVAC (Heating, Ventilation & Air Conditioning)

The **GOAL** of HVAC in the Physical Plant

- Provide consistent, appropriate temperature and humidity range to primary enclosure
- Control
 - Odors
 - Allergens
 - Particle generation
 - Metabolically-generated gases

HVAC (Heating, Ventilation & Air Conditioning)

Temperature

- Consistent - avoid wide swings in daily temps
- Within *Guide* recommended ranges
- Consideration of special needs
 - Hairless rodents
 - Neonates
 - Rabbits
 - Chickens



HVAC (Heating, Ventilation & Air Conditioning)

Other Temperature Considerations

- Type of primary enclosure (static microisolators, ventilated cage systems)
- Animal density
- Cage changing frequency
- Bedding type



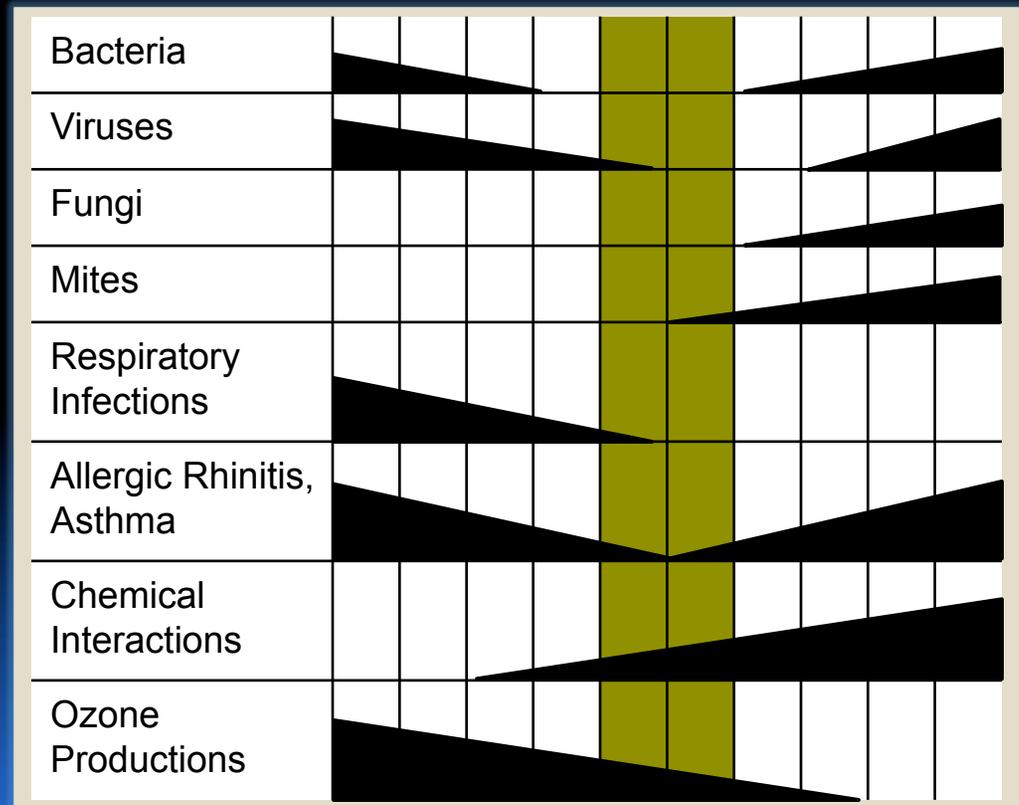
HVAC (Heating, Ventilation & Air Conditioning)

Humidity

- Short periods outside the range with no adverse effects on animals acceptable
- 30-70% acceptable

Relative Humidity
10 20 30 40 50 60 70 80 90 100

Why worry about humidity?



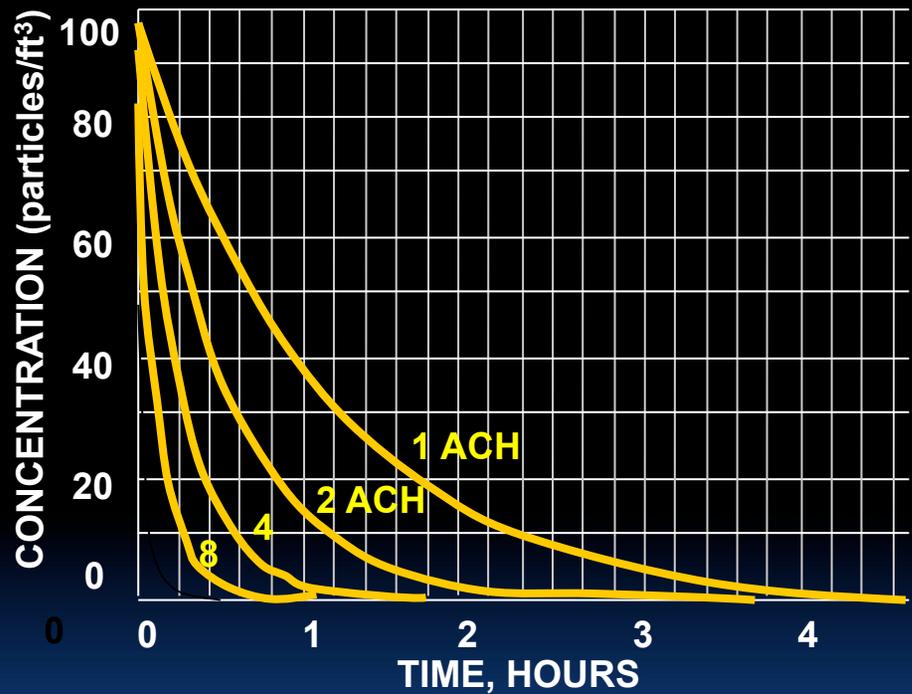
HVAC (Heating, Ventilation & Air Conditioning)

Ventilation

- Purpose
 - Supply oxygen
 - Remove thermal loads (animals, lights, equipment)
 - Dilute gaseous and particulate contaminants
 - Control humidity
 - Create pressure differentials between spaces
- Ventilation parameters do not always equal that of the primary enclosure !
 - Individually ventilated cages (IVC)
 - Isolators (containment or exclusion)

HVAC

Recommended
10 – 15 ACH (ASHRAE & *Guide*)



Typical Air Changes
per Hour (ACH)

Offices	
Business Office	6-8
Lunch / Brk Room	7-8
Conference Room	8-12
Med Procedure Room	9-10
Copy Room	10-12
Main Computer Room	10-14
Smoking Area	13-15

Kowalski, W.J., *et al. Cont. Top.* 2002, 41(3): 9-17

HVAC (Heating, Ventilation & Air Conditioning)

Achieving a stable HVAC depends upon:

- Room dimensions
- Requirements for pressure dynamics (surgery, containment, barrier, waste management)
- Heat loads
 - Density of animals
 - Species
 - Equipment

HVAC is a Performance Standard !



HVAC (Heating, Ventilation & Air Conditioning)

Achieving a stable HVAC depends upon: (con't)

- Bedding type
- Cage changing frequency
- Efficiency of air distribution to primary enclosure
- Air filtration requirements (supply vs. exhaust)
- Monitoring frequency

HVAC is a Performance Standard !



AAALAC Conclusions (Physical Plant)

Order of the Most Common Facility Deficiencies:

- Heating, Ventilation and Air Conditioning (HVAC)
- **Construction Guidelines**
- Functional Areas (facilities for aseptic surgery)

Construction Guidelines

Frequency Order of Specific Issues

- Floors, walls, ceilings in disrepair and not sanitizable
- Failure to use moisture-proof electrical outlets or ground-fault interrupters in areas with high water use
- Inappropriate storage of cages and equipment outside, on the floor, in corridors or in animal rooms

Construction Guidelines

Floors

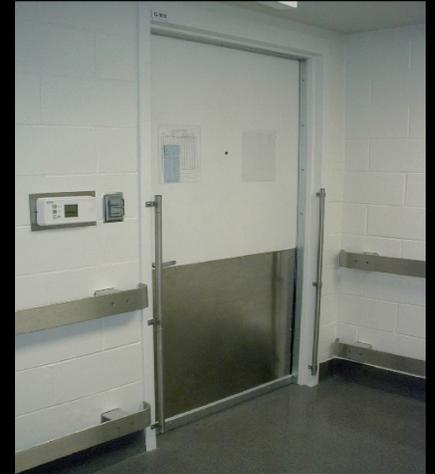
- Moisture resistant, relatively smooth
 - Textured in high moisture areas
- Monolithic or minimal number of joints
- Nonabsorbent
- Impact resistant
- Service resistant
 - Resistant to biological materials
 - Resistant to cleaning agents



Construction Guidelines

Walls

- Moisture resistant, smooth
- Monolithic or minimal number of joints
- Nonabsorbent
- Impact Resistant
 - Curbs, guardrails, bumpers, corner guards
- Service resistant
 - Resistant to biological materials
 - Resistant to cleaning agents
- Minimize outside noise penetration



Construction Guidelines

Ceilings

- Moisture resistant
- Monolithic or minimal number of joints
- Nonabsorbent
- Impact Resistant
- Service resistant
 - Resistant to biological materials
 - Resistant to cleaning agents
- Minimize outside noise penetration
- Special ceilings
 - Suspended ceilings in animal facilities?
 - Exposed plumbing, duct work, suspended light fixtures

Construction Guidelines



Electrical safety

Areas of high water use (cagewash, aquaria)

- Moisture-resistant switches/outlets
- Ground-fault interrupters

Storage

- Adequate storage space for equipment, supplies, food, bedding and waste should be provided

AAALAC Conclusions (Physical Plant)

Order of the Most Common Facility Deficiencies:

- Heating, Ventilation and Air Conditioning (HVAC)
- Construction Guidelines
- **Functional Areas (facilities for aseptic surgery)**

Functional Areas (Aseptic Surgery)

Frequency Order of Specific Issues

- Appropriate functional areas not available for type of surgery performed
 - Non-rodent mammalian
 - Rodent
 - Aquatics

Functional Areas (Aseptic Surgery)

Non-rodent Mammalian Survival Surgery

Five functional components of the *Guide*

1. Surgical support
 - Instrument preparation
 - Sterile supply storage
 - Autoclave (or one nearby)
 - Dressing area or locker room
2. Animal preparation
3. Surgeon's scrub (hands-free sink)
4. Operating room
5. Postoperative recovery (support equipment)

Functional Areas (Aseptic Surgery)

Non-rodent Mammalian Survival Surgery

- Dedicated facility required
- Minimize contamination
 - Minimal traffic
 - 'Cleanest' part of facility possible
 - Positive relative air pressure
- Monolithic surfaces, impervious to moisture
- Minimize fixed equipment as much as possible
- Gas scavenging capability

Functional Areas (Aseptic Surgery)

Rodent Survival Surgery

- Dedicated facility not required
- Area which is 'clean'
- Positive relative air pressure
- Sanitizable surfaces
- Gas scavenging capability
- Serial procedures possible
 - Autoclave instruments initially
 - 'Glass bead' sterilizer for subsequent procedures

Functional Areas (Aseptic Surgery)

Aquatic Survival Surgery

- Dedicated facility not required
- Area which is 'clean'
- Sanitizable surfaces
- Skin surface is not generally disinfected
- Water support for patient is critical
- GFCI circuits are required for safety
- Serial procedures possible
 - Autoclave instruments initially
 - 'Glass bead' sterilizer for subsequent procedures

<http://ori.dhhs.gov/education/products/IACUC/home.html>

An IACUC Member's Guide to Animal Facility Inspections

An IACUC Member's Guide to Animal Facility Inspections

Virtual Tours | Resources | Help

An IACUC Member's Guide to Animal Facility Inspections

Overview

An IACUC Member's Guide to Animal Facility Inspections is a free, online course primarily intended for persons sitting on an Institutional Animal Care and Use Committee (IACUC) who conduct mandated inspections of animal facilities for compliance with U.S. regulatory standards. This includes veterinarians, scientists, public committee members, and administrators. The course can be used as primer for new committee members, as a resource for more veteran members, or it may function as a field guide when loaded on a mobile computer.

The course addresses the regulatory requirements for animal facilities, including housing, surgery, cleaning, and storage areas. Each area is presented in a 360-degree panoramic image containing some commonly inspected items. The module provides tips for inspecting items and links to relevant regulatory documentation. Users may test their understanding with questions provided for each inspection item and with a quiz after completing the virtual tours. The time needed to complete the session is approximately 90 minutes, but may be longer depending on links

http://ori.dhhs.gov/education/products/IACUC/images/ori_intro.mov

Internet 100%

Guide to Animal Facility Inspections, ORI, Wake Forest, Duke

Rodent Housing > Hotspot 8

Food and Water



"food shall be wholesome, palatable, and free from contamination and of sufficient quantity and nutritive value to maintain all animals in good health..."

more: [show](#) | [hide](#)

next hotspot

Inspection Details:

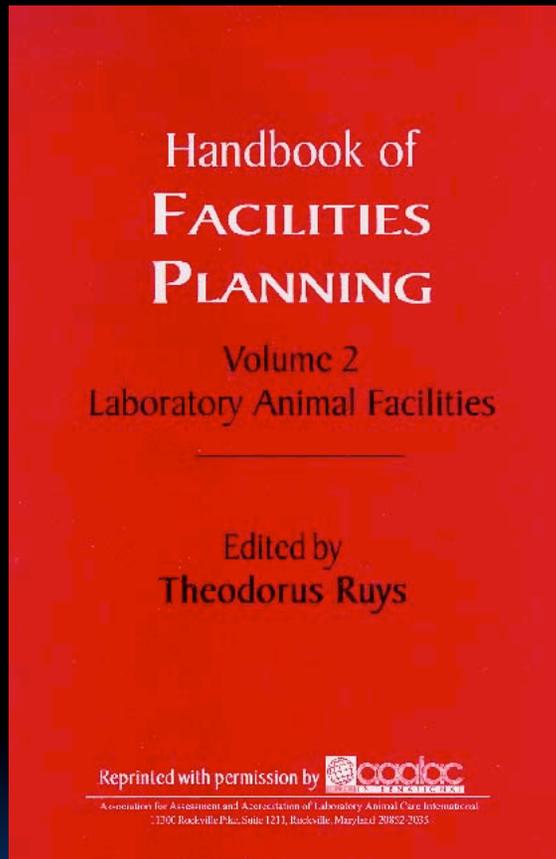
- Appropriate food for species.
- Feeding of sufficient quantities at least daily.
- Feed provided in a manner that prevents contamination.
[more](#)
- Fruit and vegetable supplements to be free of contamination, if they are provided directly on bedding to hamsters and guinea pigs (AWR §3.29,e).
- Records for food for fluid restricted animals.
[more](#)
- Watering as needed by species.
- A program to ensure water quality.
[more](#)

Q and A:

- Name three details to look for related to rodent feed.

Resources

www.aaalac.org/resources/available.cfm



- Details on codes, regulations and standards
- Laboratory animal facilities planning and design including architectural finishes and costs issues
- Overview of equipment and mechanical systems

CD ROM or spiral bound book

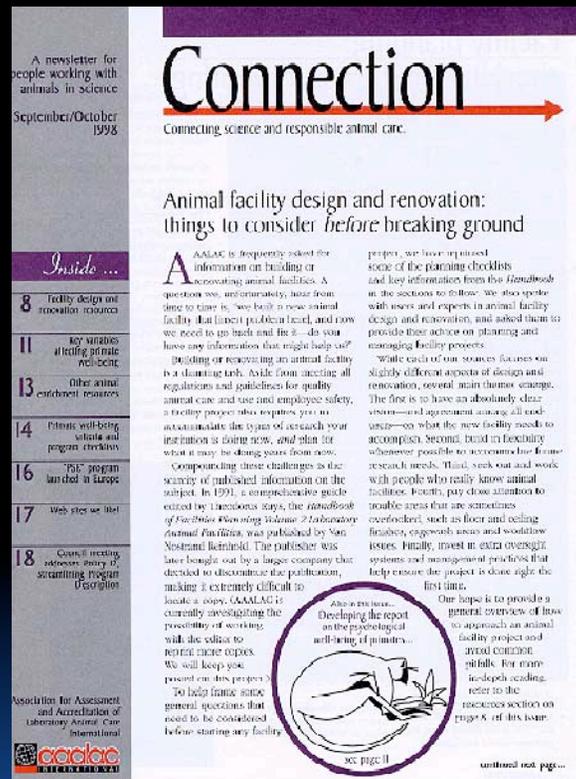
Resources



- Planning and Designing Research Animal Facilities (2009)
- American College of Laboratory Animal Medicine Series

Resources

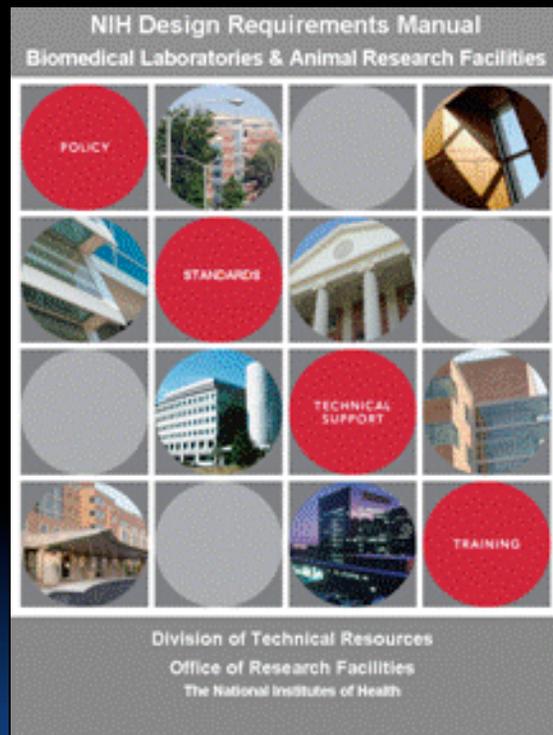
www.aaalac.org/publications/connection/fall_1998.pdf



- Connection Newsletter: "Animal Facility Design and Renovation: Things to Consider Before Breaking Ground"
- Free download from AAALAS website

Resources

<http://orf.od.nih.gov/PoliciesAndGuidelines/FacilitiesPoliciesandGuidelines/DesignRequirementsManualPDF.htm>



- NIH Design Requirements Manual for Biomedical Laboratories and Animal Research Facilities (2008)
- Contains a section on animal research facilities
- Free PDF version available

Resources

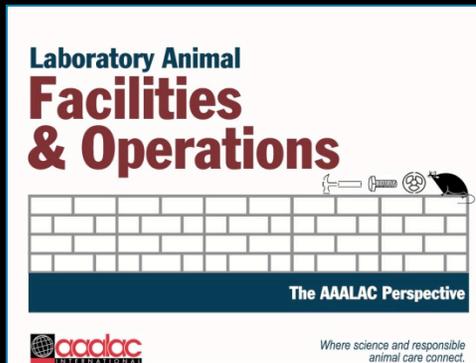
<http://books.nap.edu/catalog/9799.html>

Laboratory Design, Construction, and Renovation: Participants, Process, and Product (NAS, 2000)

- Contains information on both laboratory and animal facility construction
- Free access at National Academy of Sciences website



Resources



www.aaalac.org/resources/available.cfm

AAALAC PowerPoint presentation: "Facilities and Operations"

Free download



www.animallab.com

Animal Lab News: magazine focuses on animal research facility design

- Free subscription to qualified professionals
- Articles available online

Resources

- Animal facility design and renovation: things to consider before breaking ground. AAALAC International Connection Newsletter. September/October, 1998.
- Baldwin, A, et al. Are investigators aware of environmental noise in animal facilities and that this noise may affect experimental data? *J Am Assoc Lab Anim Sci*. 2007 Jan; 46(1): 45-51
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References

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