Laboratory Design Best Practices

GBRMC

GLOBAL BIORISK MANAGEMENT CURRICULUM

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web: biosecurity.sandia.gov/gbrmc
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Biorisk Management: the AMP Model

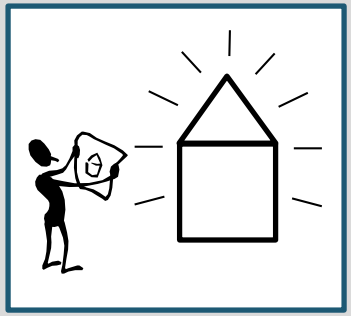
Biorisk Management =
Assessment, Mitigation, Performance

Laboratory Design Best Practices

This course is designed to aid in Biorisk Management by promoting good bioscience lab design practices.

Programming & Pre-Design

Programming and Pre-Design activities give form to the **problem**, in order to inform the design activities which will later provide the **solution.**

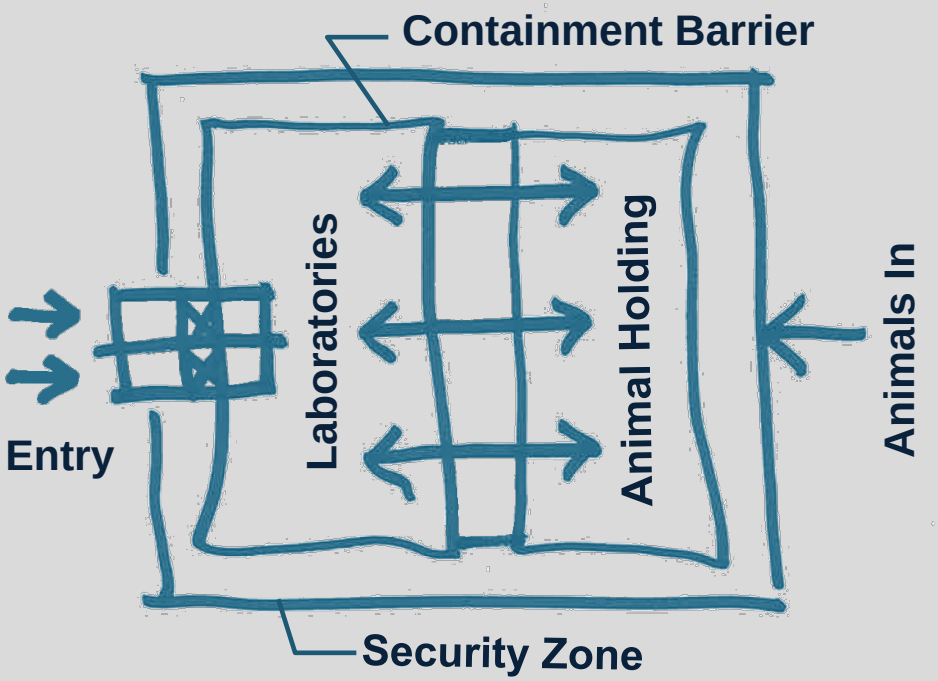


By asking a well-rounded group of stakeholders questions about their **needs, wants,** and **desires**.

Laboratory Design Best Practices

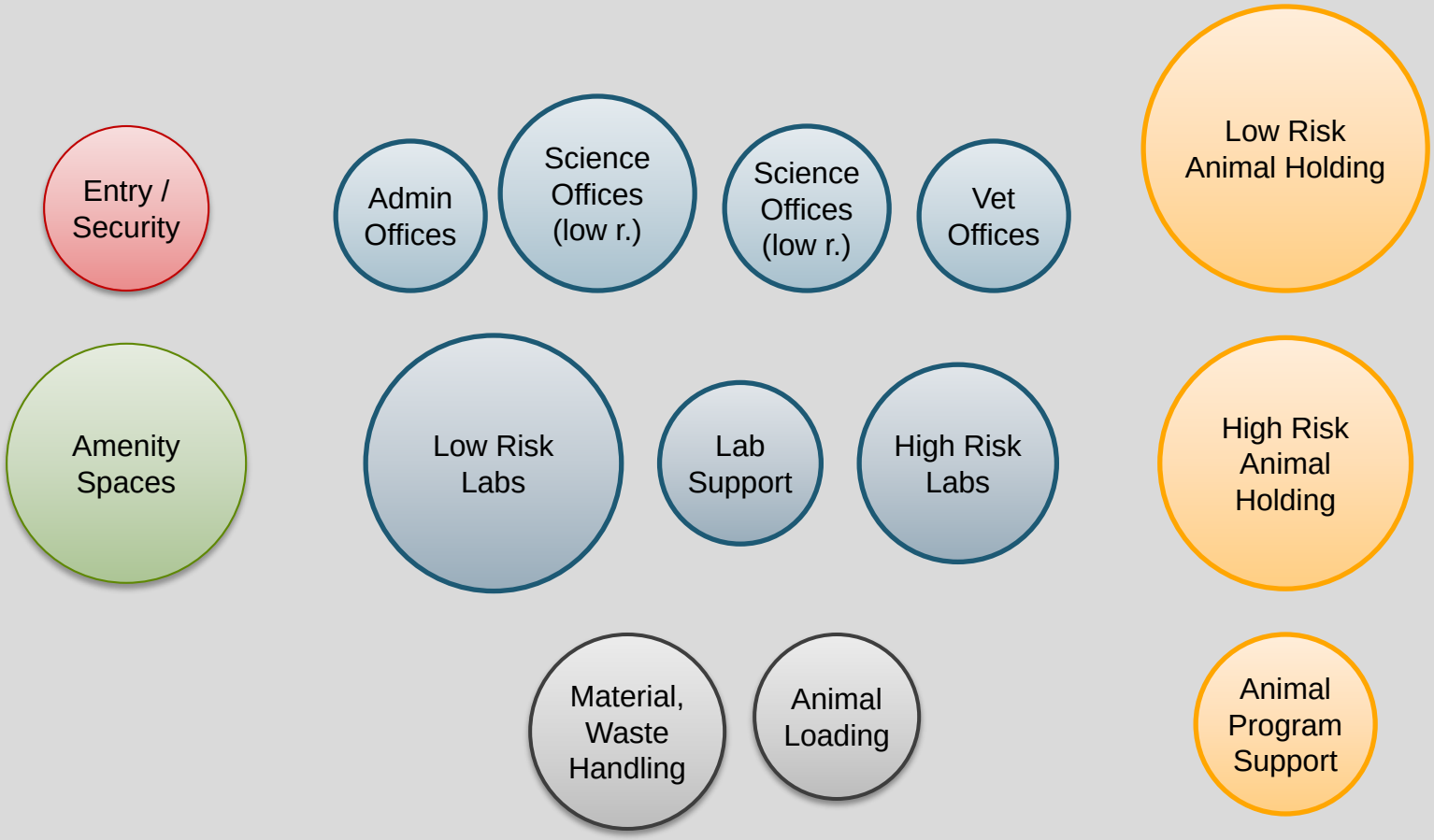
"Big Picture" organization will later have a profound influence on:

- Functional Relationships
- Biosecurity Design
- Containment Concepts
- Biosafety Protocols
- Service Layouts
- Building Construction



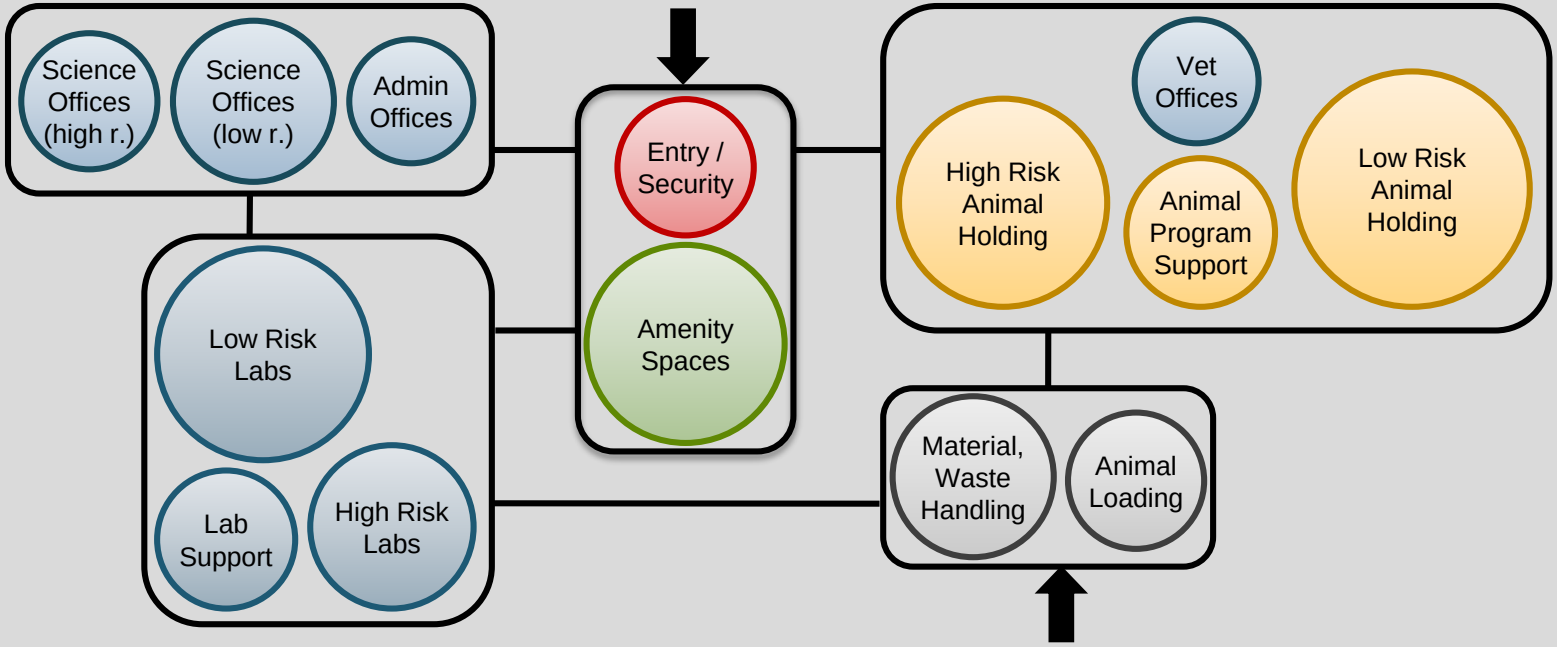
Zoning and Organization

Program components of a hypothetical project



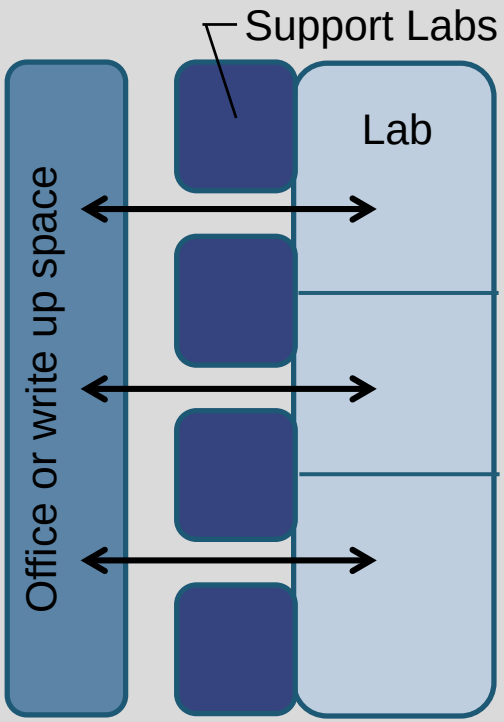
Zoning and Organization

Zoning Diagram 1 -Lab and animal areas grouped separately

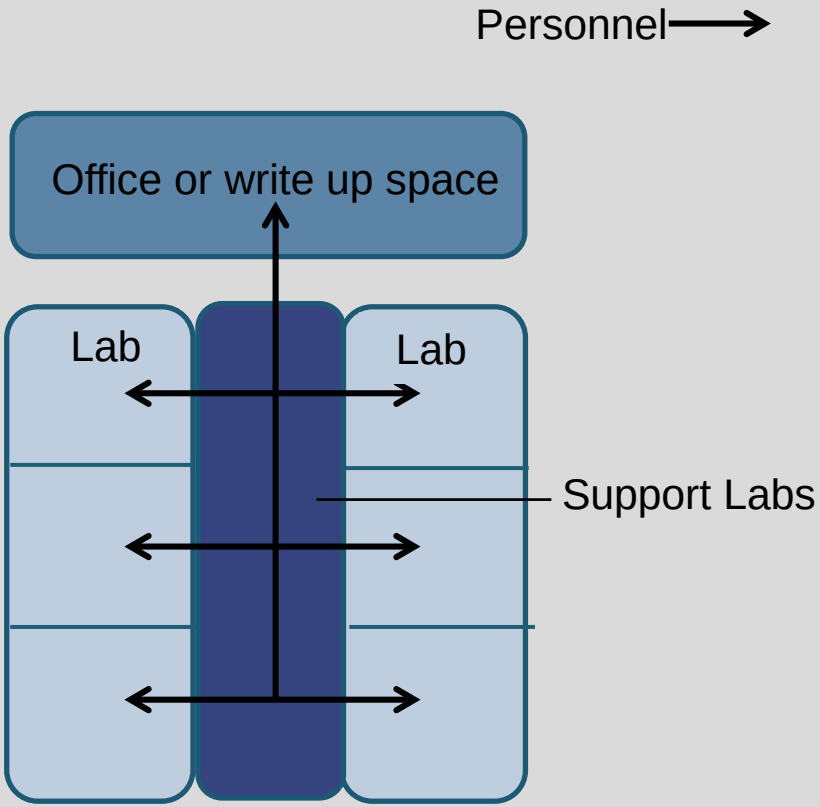


Efficiency and Flows

Basic Laboratories



Office/write up integrated with labs



Office/write up separated from labs

Biological Safety – Design Principles

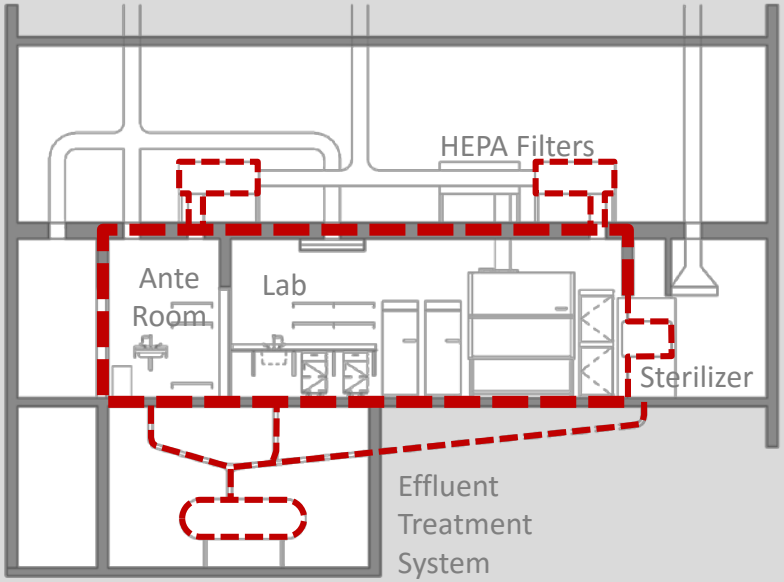
Safety protocols and design features that help:

- Protect Users
- Protect those outside labs
- Protect the environment

Biological Safety – Design Principles

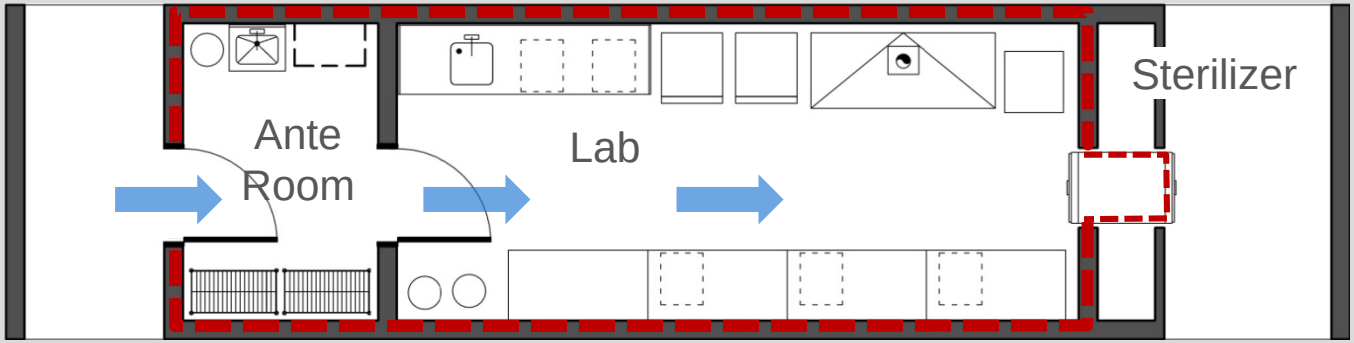
Equipment that is built into the containment barrier, and any services that penetrate the containment barrier, become a part of the barrier as well.

- HEPA Filters
- Sterilizers
- Dunk tanks, pass boxes
- Doors and windows
- Plumbing penetrations
- Electrical penetrations



Biological Safety – Design Principles

Design to allow for **directional airflow**.

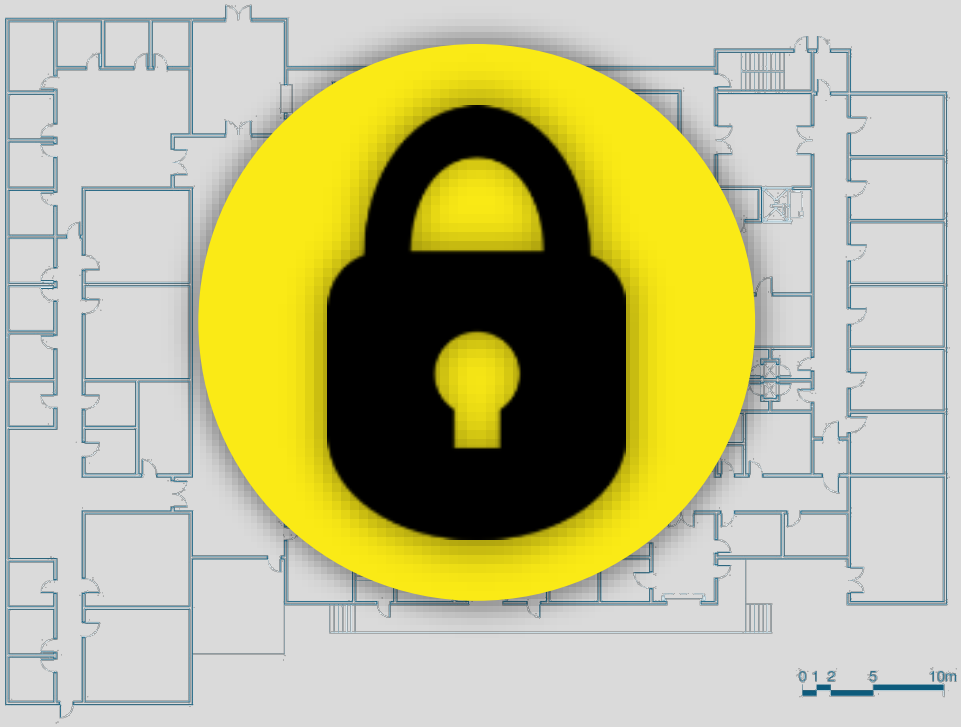


Where openings through the containment barrier are required **directional airflow**, from low risk areas in towards higher risk areas, helps to prevent the escape of infectious agents.

Biological Security – Design Principles

Security protocols and design features that help:

- Protect Users
- Protect those outside labs
- Protect the environment



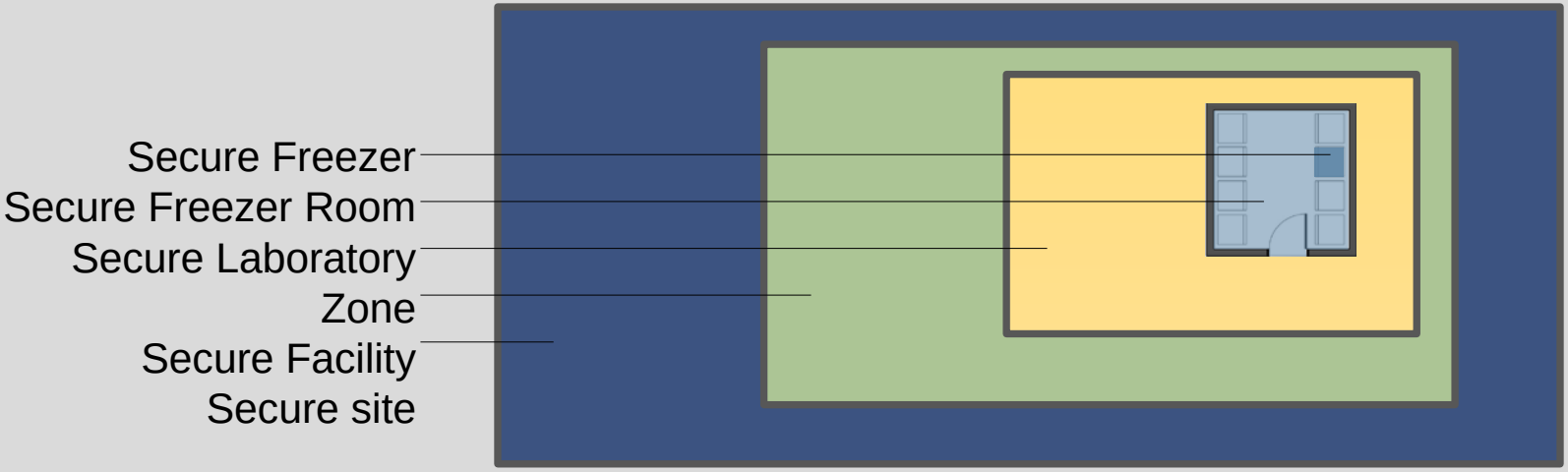
Biological Security – Design Principles

- Biological agents or toxins should be secured in locked and monitored freezers or cabinets as appropriate to the material.
- Access should be restricted to only those who need the material to carry out their work.




Biological Security – Design Principles

The lab zone will usually be within a larger secure facility, which in turn should be located on a secured site, creating multiple layers of protection.



These layers are referred to as security zones.

Biological Security – Design Principles

Access control devices can be as simple as a guard opening a gate or as complex as an iris scanning or finger print reading device opening an electronic lock on a door.





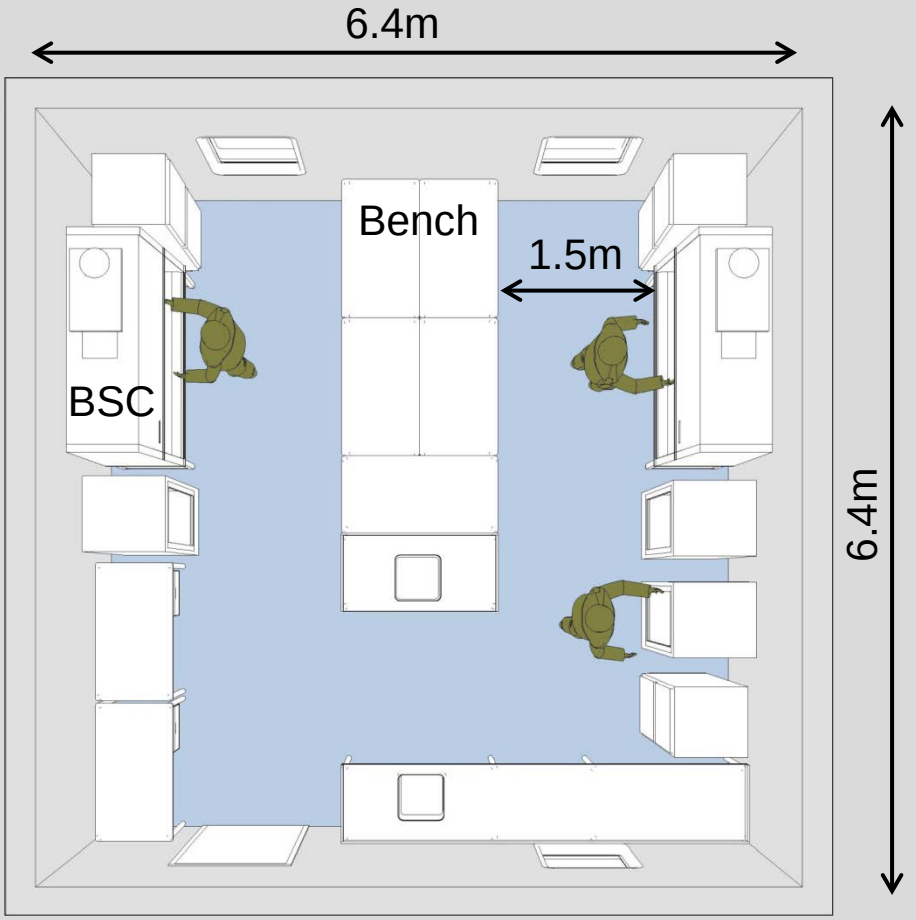
Biological Security – Design Principles

- Restricting and controlling access to biological agents and toxins should be accompanied by a process for **monitoring access** as well.
- Monitoring can be any combination of:
  - Recording who enters and exits the secure areas
  - Recording who accesses the agents
  - Visually monitoring access control points and secure storage areas

Detailed Planning Principles

Laboratory Plan

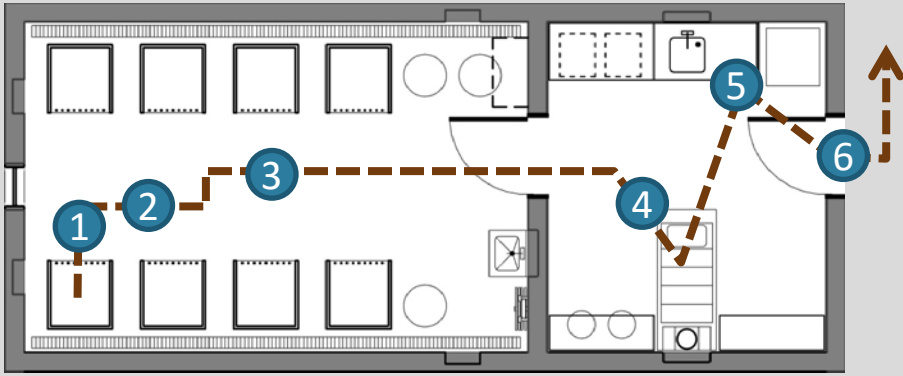
- BSCs placed away from traffic areas
- Hand washing sink near exit
- Shared sink and equipment accessed without disruption of work areas
- Incubators/fridges/ bench space near BSC



Balancing Design with Protocols

Protocol mapping

- Mapping out step by step protocols identifies areas of risk and uncovers needs
- When risks are discovered design team works with the scientific & biosafety personnel to solve with a combination of design and protocols



1. Animal subject sedated in cage
2. Subject removed once asleep
3. Subject placed on cart, covered and moved to procedure
4. Subject placed on table, blood or tissue sample taken
5. Sample packaged at bench and placed in double container
6. Sample taken from procedure area to lab for analysis

Balancing Design with Protocols

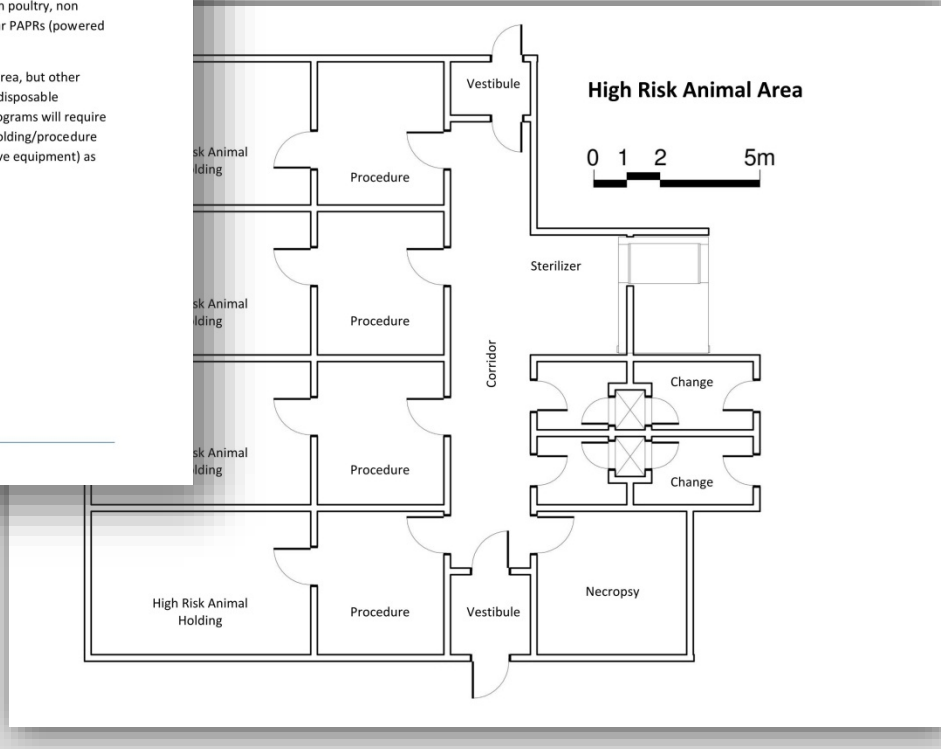
Plan and Protocols

Protocol Mapping Scenario.

Users of the High Risk animal area have described the following protocols. Clarify the protocols into step by step procedures and map these out on the given plan. You may modify the plan as you see fit if necessary to create a safe & efficient combination of design and protocols.

Users of the High Risk area anticipate they will work a variety of agents and will study the diseases they manifest in poultry, non human primates, rabbits and rodents. Some of the diseases may be highly infectious and will require users to wear PAPRs (powered air purifying respirators).

The users anticipate that higher risk programs will require them to take body showers upon exit from the animal area, but other programs may require less stringent protocols. These less stringent protocols will likely include wearing full body disposable coveralls, shoes dedicated to the lab area, gloves and N95 masks for respiratory protection. At a minimum all programs will require users to remove lab overcoats, gloves and shoe coverings and to wash their hands as they exit individual animal holding/procedure areas, and all users will remove their lab dedicated shoes, coveralls and any other required PPE (personal protective equipment) as they exit the animal holding area.



Flexibility

Laboratories and animal areas will be better utilized and last longer if they are flexible to accommodate changes over time.

- A **flexible design** can easily accommodate changes in function and equipment
- An **adaptable design** can easily be changed to suit a new purpose
- An **expandable design** can grow as needs increase over time

Thank You!

Don’t forget to complete your evaluation!

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