

USAMRIID



Medical R&D Laboratories

2006 Tri-Service Healthcare Facilities Symposium

**U.S. Army Medical Research Institute of Infectious
Diseases**

Agenda

- **USAMRIID Capabilities**
- **Biosafety**
 - **Definitions**
 - **Containment Facilities**
 - **Laboratory Security**
 - **Environmental Safety**

The views, opinions and findings contained herein are those of the author and should not be construed as an official Department of the Army position, policy, or decision unless so designated by other documentation.

Core Mission

Conduct basic and applied research on biological threats resulting in medical solutions (prophylactic vaccines, therapies and medical diagnostics) to protect the war fighter.

USAMRIID is a subordinate laboratory of the U.S. Army Medical Research & Materiel Command

Potential Biowarfare Agents

Bacteria/Rickettsia

Anthrax →



Brucellosis

Cholera



Plague →

Shigella

Tularemia

Q-Fever →



Typhus

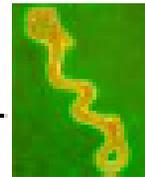
Viruses

Smallpox

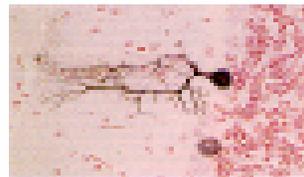
Rift Valley Fever

Crimean-Congo

Hemorrhagic Fever

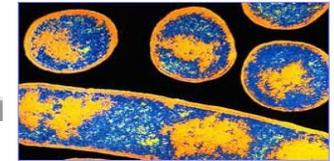


VEE



Toxins

Botulinum



Ricin



SEB →

T2 Mycotoxins

Saxitoxin

C. perfringens toxins

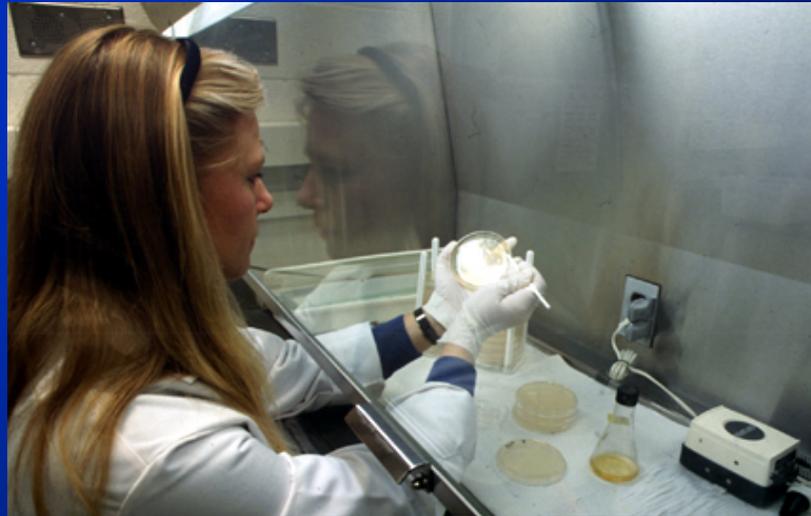
Neurotoxins

Aflatoxin

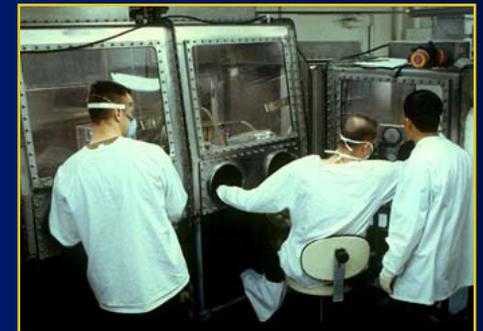
Unique USAMRIID Capabilities



**Containment
Laboratory Operations**



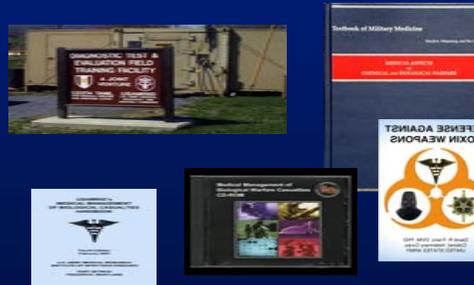
Expert Knowledge



**Medical R&D
& GLP Studies**



Clinical Studies

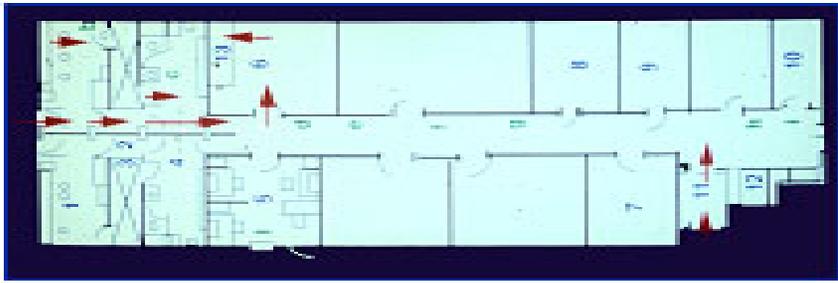


Training and Education



**Rapid Response
& SMART Teams**

Unique USAMRIID Facilities



- Largest collection of biosafety level-4 in US
- Largest animal containment care facility
- Large Animal Care Facility (Farm)
- Unique *Center for Aerobiology*
- *Field Laboratory Training Center*
- Nation's Only BSL-4 Patient Care Suite

Principles of Biosafety

Introduction

Biosafety Levels 1-4 Provide

- Increasing levels of personnel and environmental protection
- Guidelines for working safely in microbiological and biomedical laboratories

Biosafety Level Differences

<u>Level</u>	<u>Description of Agent</u>	<u>Containment Facilities</u>
BSL-1	Microorganisms not known to cause disease in healthy adult humans (<i>Bacillus subtilis</i> , infectious canine hepatitis)	Basic
BSL-2	Indigenous, moderate-risk agents associated with human disease of varying severity (Hepatitis B virus, <i>Salmonella</i> Sp.)	Basic

Biosafety Level Differences

(continued)

<u>Level</u>	<u>Description of Agent</u>	<u>Containment Facilities</u>
BSL-3	Indigenous or exotic agents where the potential for infection by aerosol exists and disease may have serious-to-lethal consequences (Yellow fever virus, Venezuelan equine encephalitis)	Containment
BSL-4	Dangerous and exotic agents that pose a high risk of life-threatening disease (Lassa fever virus, Ebola virus, Marburg virus)	Maximum Containment

Barriers

**Primary Barriers--Safety
Equipment**

**Secondary Barriers--Laboratory
Facilities**

Tertiary Barriers--Building

Primary Barriers

Safety Equipment

- Biosafety cabinets (BSCs)
- Personal protective clothing/equipment
 - Gloves
 - Gowns
 - Eye and face protection
 - Respiratory protection [BSL-3E and BSL-4]
- Pipetting devices
- Safety centrifuge cups and rotors

Powered Air Purifying Respirator (PAPR)



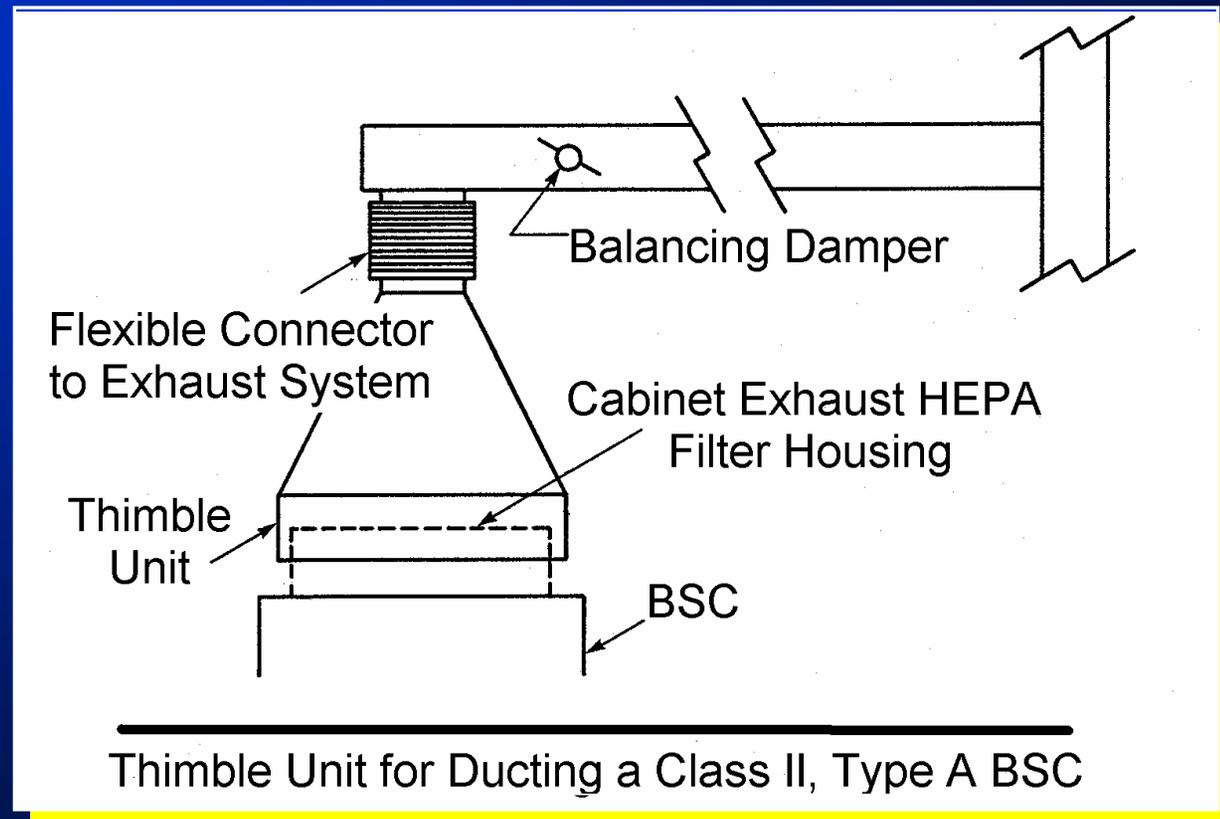
Positive Pressure Protective Suit



Biosafety Level 3 & 4

Safety Equipment (Primary Barriers)

- BSC class II or III to manipulate infectious material



Class III Biological Safety Cabinet System

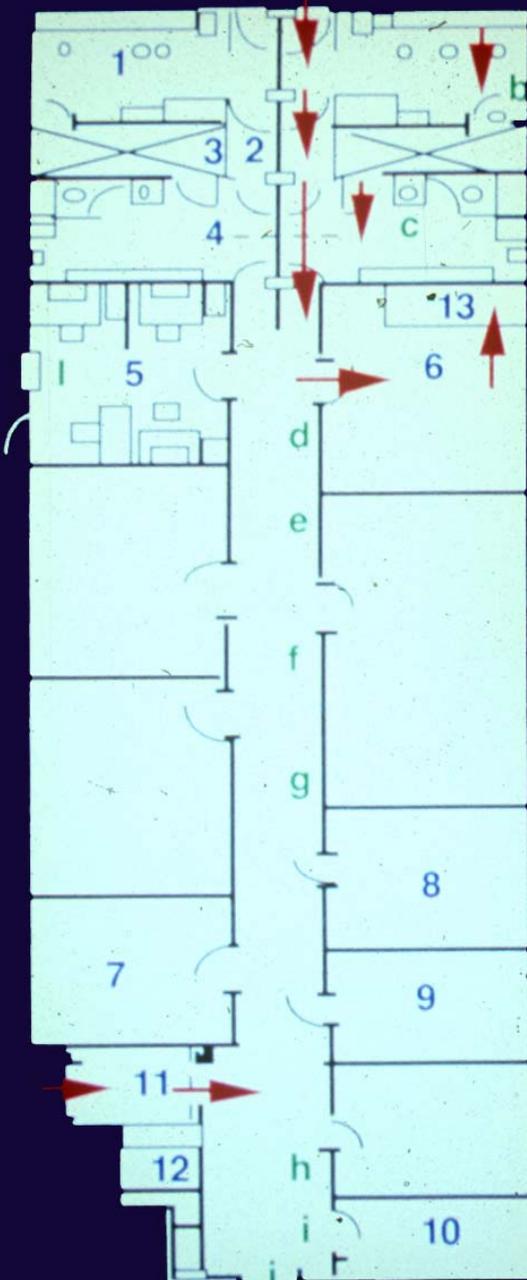


Secondary Barriers



Negative air flow

- ☰ Air flows from outermost (perimeter labs), to internal labs where work is being performed in a BSC
- ☰ 10 air changes / hour for labs
- ☰ 12– 15 air changes / hour for animal rooms



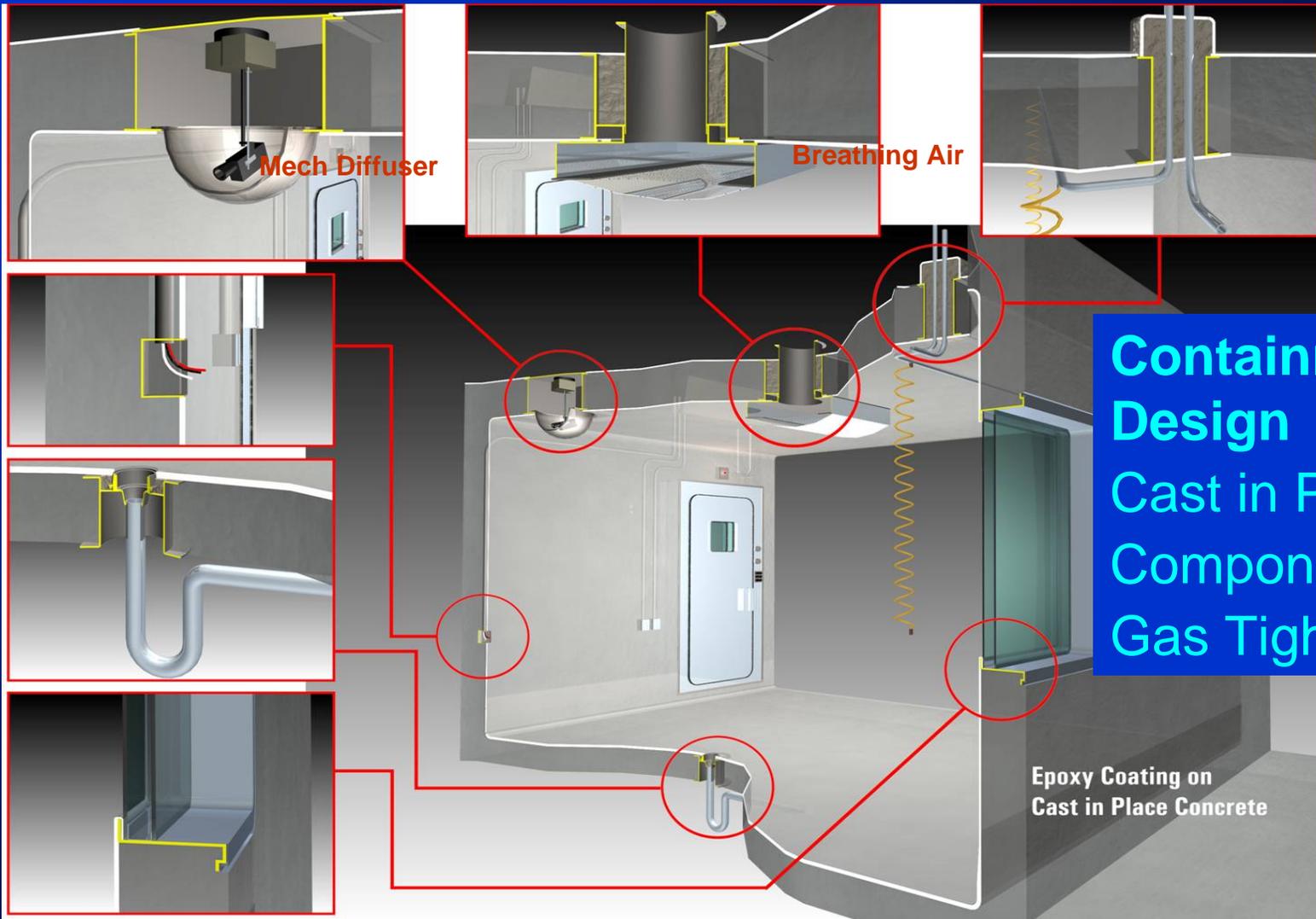
BSL-4 CHEMICAL DISINFECTANT SHOWER



Autoclaves - Containment Laboratories



High Containment Labs – Containment Barrier



Camera
Bubble

Mech Diffuser

Breathing Air

Electrical
Outlets

Floor/Sink
Drains

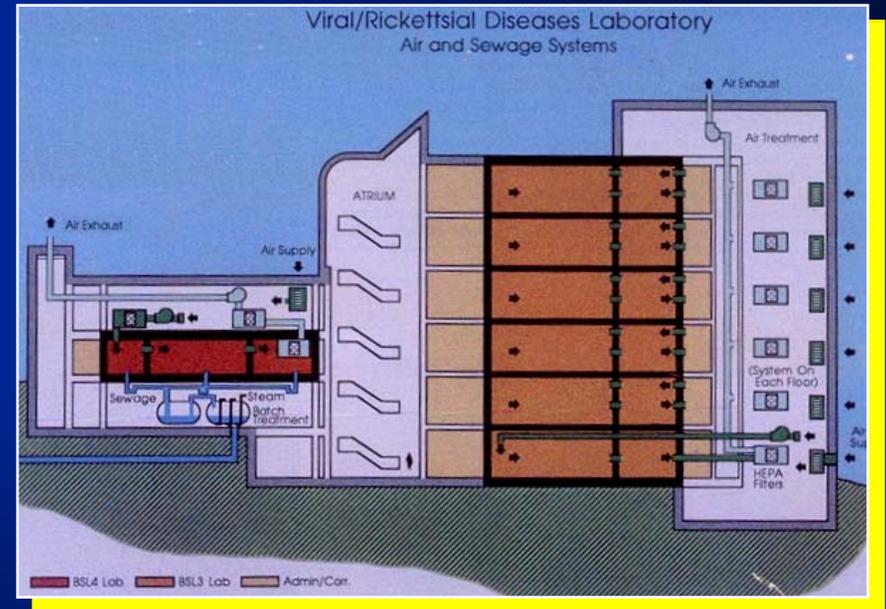
Window
Frame

**Containment
Design**
Cast in Penetrations
Component Testing
Gas Tight

Epoxy Coating on
Cast in Place Concrete

Facility Design

(Secondary and Tertiary Barriers)



- ▮ Lab location
- ▮ Lab structure
- ▮ Lab ventilation

Principles of Biosafety

Requirements

BSL 1-4

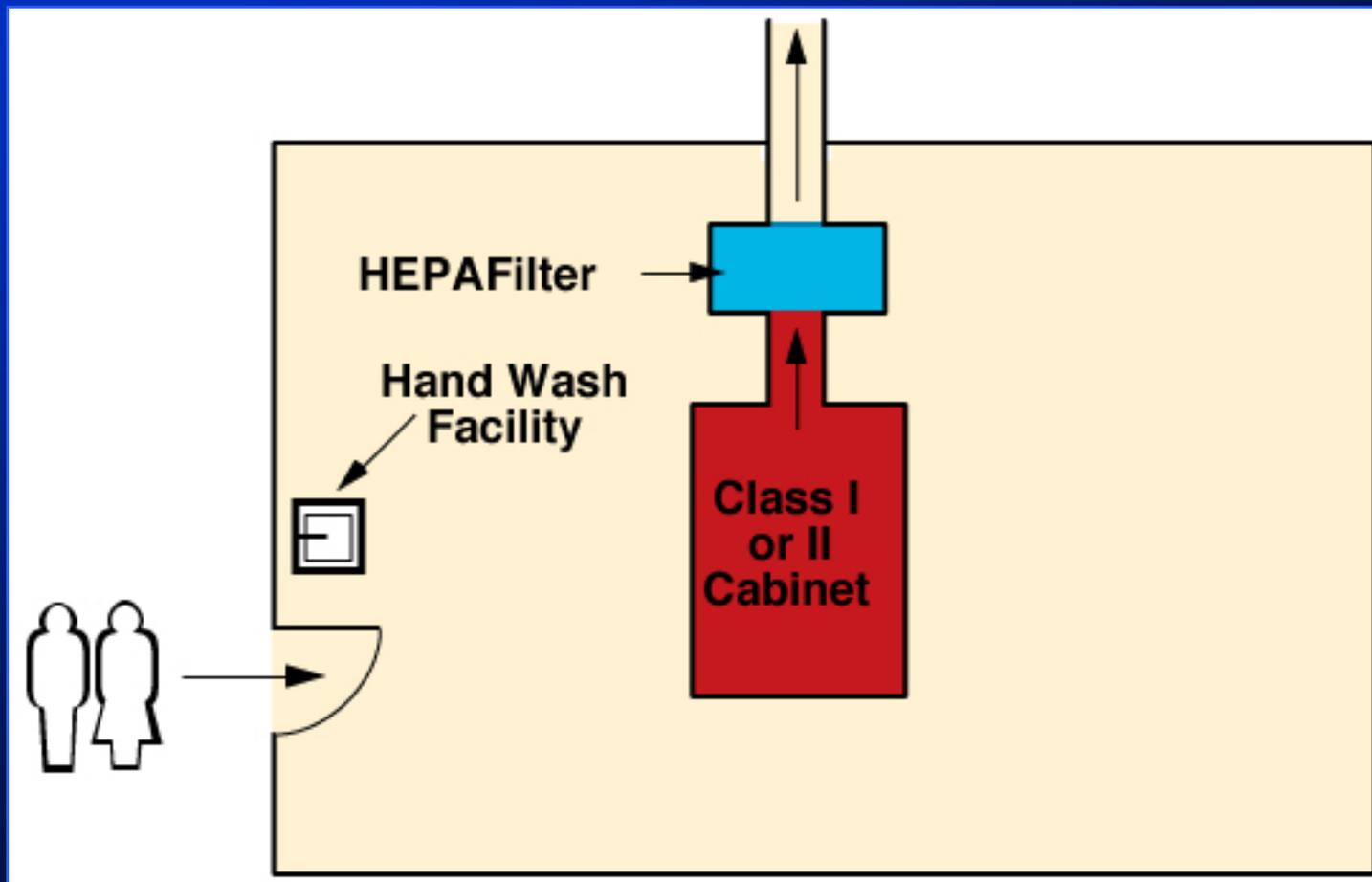
- **Standard Practices**
- **Special Practices**
- **Safety Equipment (Primary Barriers)**
- **Laboratory Facilities (Secondary Barriers)**
- **Building (Tertiary Barriers)**

Biosafety Level 2

Standard and Special Practices, Safety Equipment and Facilities

- **Limited Access (e.g. age restrictions)**
- **Biohazard Sign on Access Doors**
- **Personal Protective Equipment (PPE)**
- **Appropriate Decon Capabilities**
- **Safety Cabinet for Aerosol-Producing Work**

Biosafety Level 2 Laboratory



Biosafety Level 3

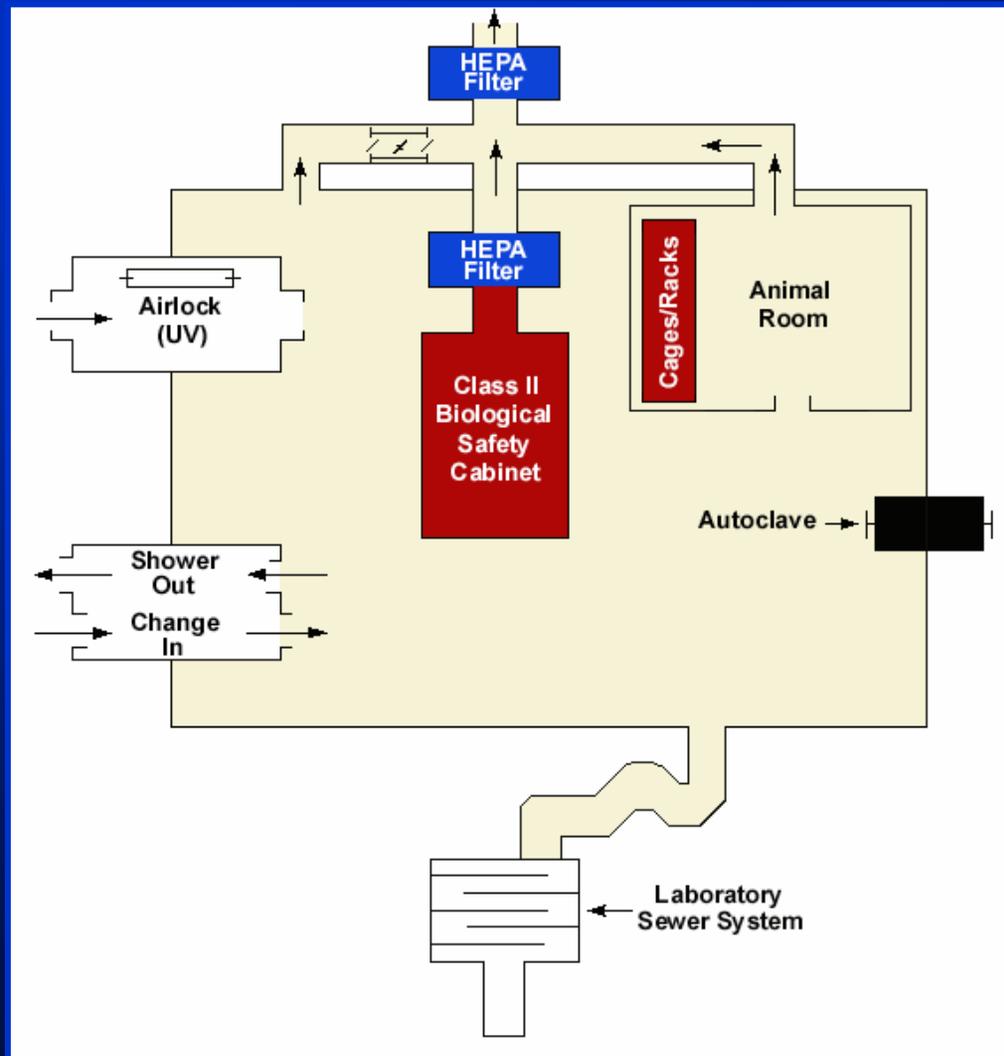
Standard and Special Practices, Safety Equipment and Facilities

BSL-2 plus:

- Double-door change room or Airlock
- Exhaust air interlocked with supply air
- Directional airflow
- HEPA-filtered room exhaust air
- Effluent Decon (Lab Sewer System)
- PPE



Biosafety Level 3 Laboratory

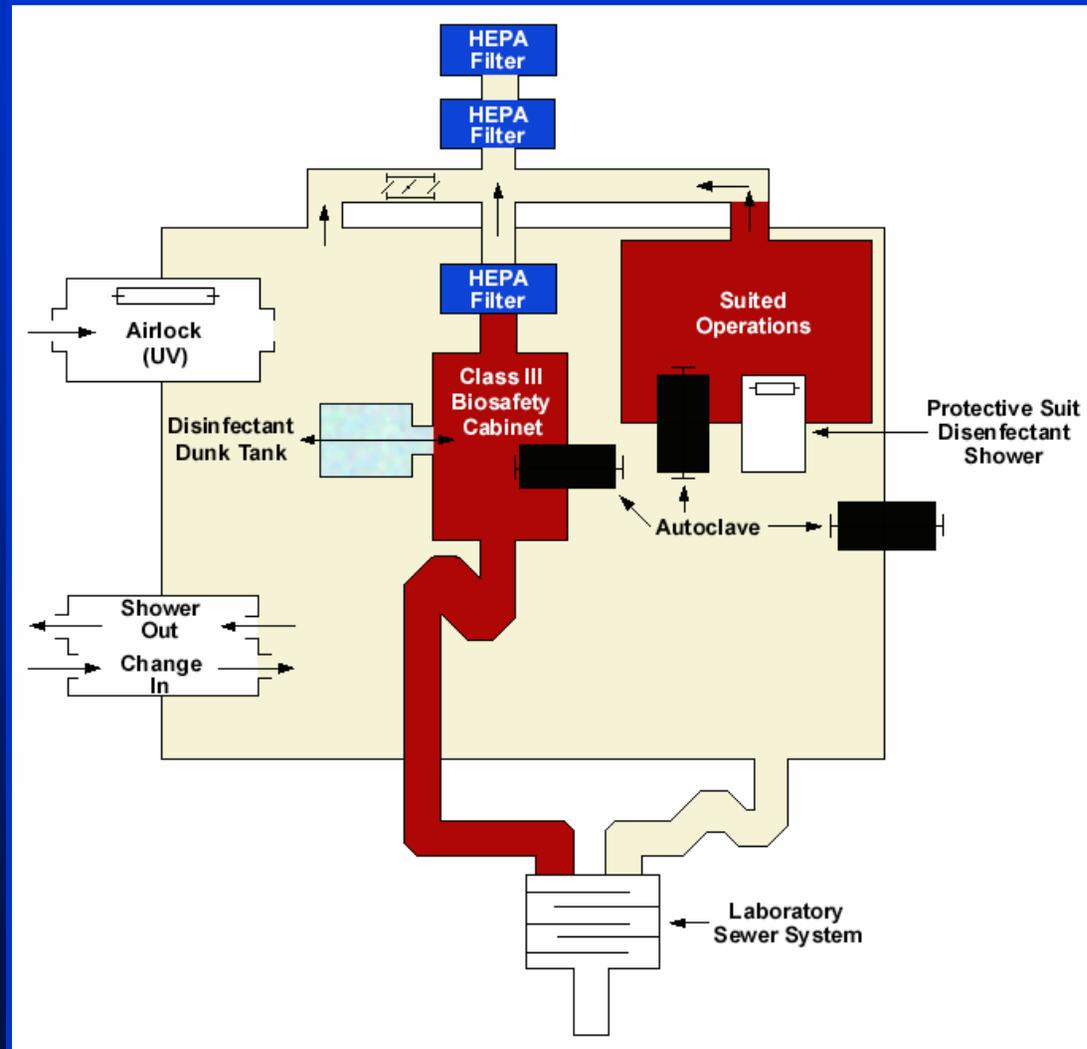


Biosafety Level 4

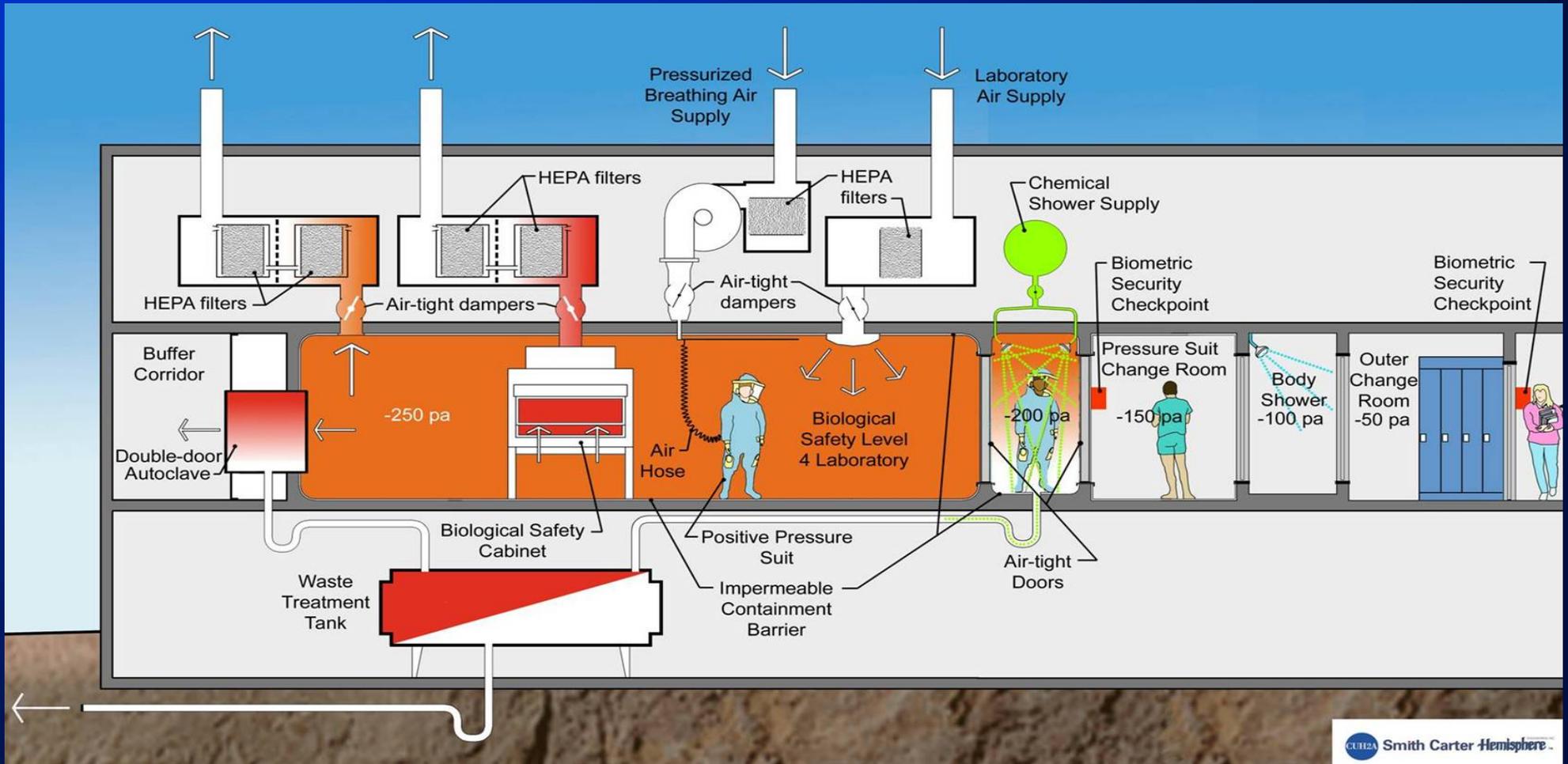
Standard and Special Practices, Safety Equipment and Facilities

- **BSL-3 plus:**
 - **Locked door access**
 - **Sterilization of all items**
 - **Individual room supply and exhaust air**
 - **Back-up filtration units (two sets of HEPA filters)**
 - **Back-up exhaust fans**
 - **Emergency power source**

Biosafety Level 4 Laboratory



High Containment Labs – Summary



Safety

Warning System for Suited Operations



Safety



Fire Alarms

Found in various locations in suite.

Heat Sensors



Security

Cameras



Motion Sensors: Motion detectors activate the intrusion alarm system.



Safety/Security

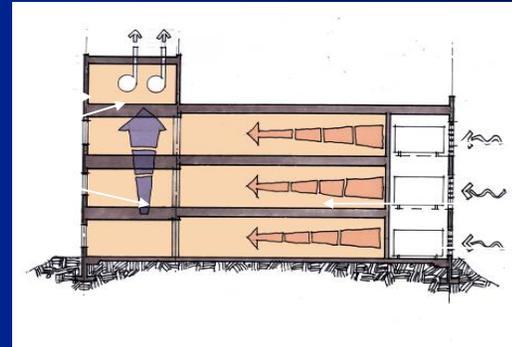
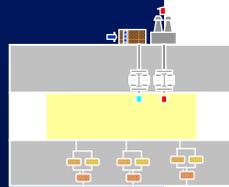
Emergency Radios

One on grey side of suite and one on the hot side.



Future USAMRIID

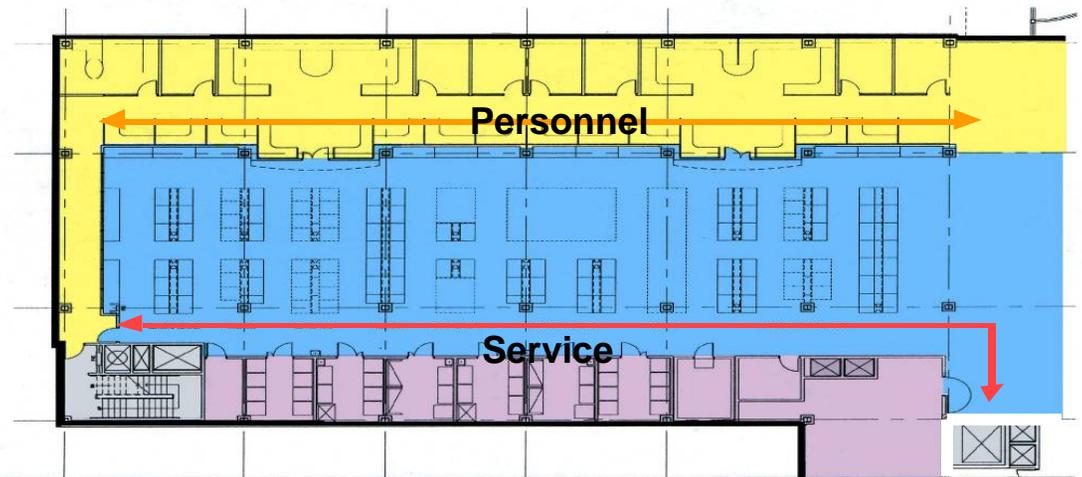
Modular Design for Functional Flexibility



Penthouse
Extract Fan
Extract
Grade

Vertical Plant Room
Air Supply
Air handler

Horizontal / Vertical Mix Distribution



Offices

Low Service Labs

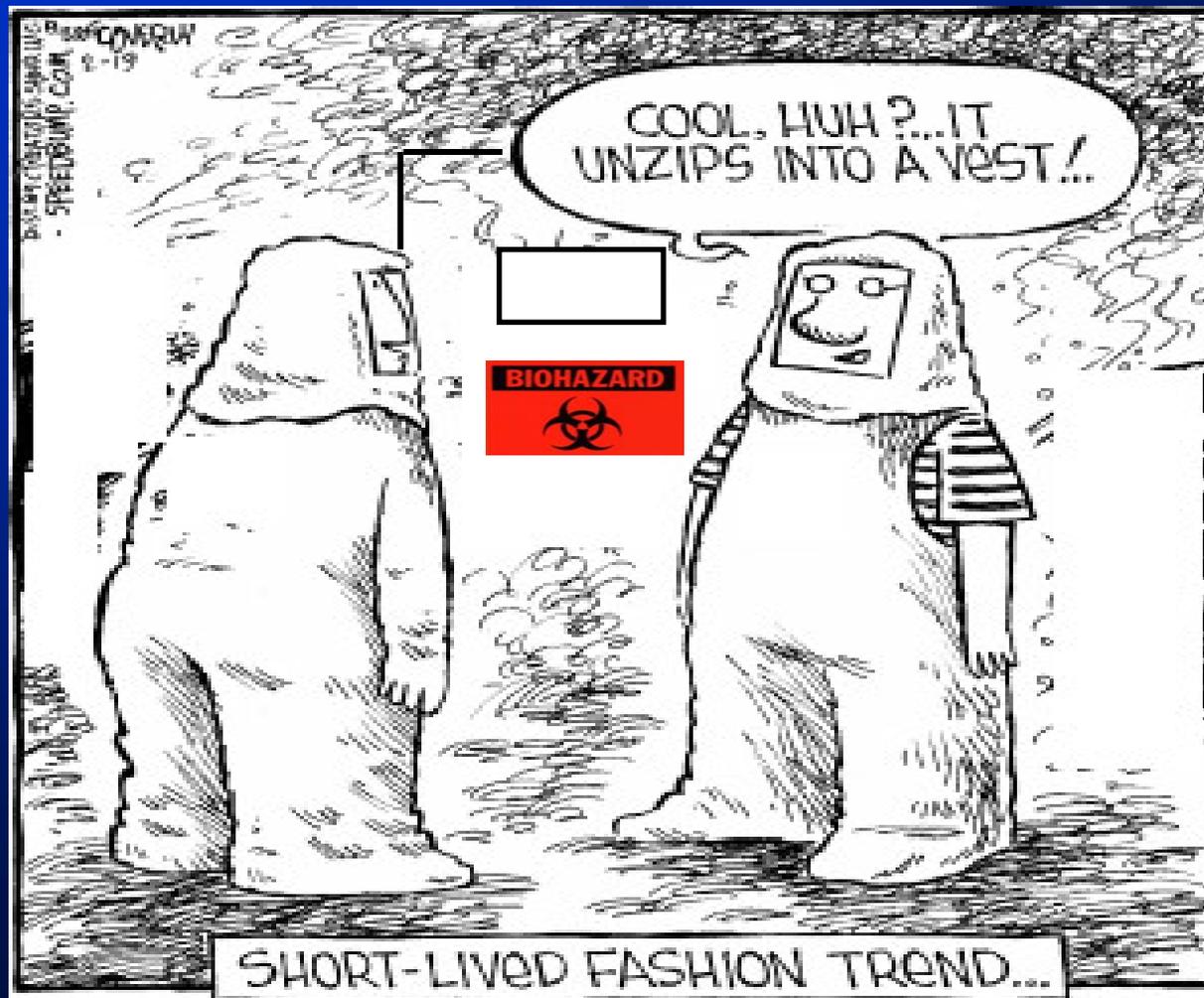
High Service Labs

Flexibility and Opportunities

Lab Base Module-Sharing

- **Shared support space maximizes available space for research—optimization**
- **Set standard “kit of parts” in support of all user groups—flexible/response allocation**
- **Shared scientific space provides opportunity for emerging technologies**

Think about new procedures before trying them out!



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Biological Defense Safety Program

[AR 385-69, 31 December 1993]

Biological Defense Safety Program

[DA Pamphlet 385-69, 31 December 1993]

Biological Defense Research Safety Program

[Command Policy, USAMRMC]

Biological Defense Safety Program

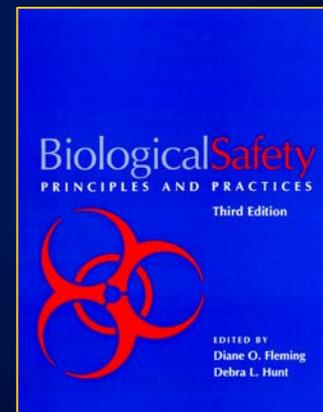
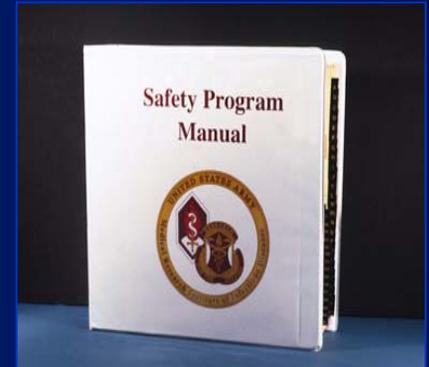
[Title 32 CFR Part 626]

Biological Defense Safety Program, Technical Safety Requirements

[DA Pamphlet 385-69], [Title 32 CFR Part 627]

Occupational Exposure to Bloodborne Pathogens

[Title 29 CFR Part 1910.1030]



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WHAT ARE YOUR QUESTIONS?

