Safety Integration in Lab Planning and Sustainability

SLCan Sustainable Laboratories Regional Workshop

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John Shannon, Safety Manager, UHN/MedRIST

Safety Integration in Lab Planning and Sustainability

It is important to ensure planning for space and operations addresses health, safety and security to ensure:

- Protection of assets, people and environment
- Regulatory compliance
- Continuity of operations

Sustainability?

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What are the health, safety and security considerations?

- **Health:** a complete state of physical, mental, and social well-being and not merely the absence of disease.

- **Safety:** the quality or condition of being safe; freedom from danger, injury, or damage.

- **Security:** a form of protection where a separation is created between the assets and the threat.

Health

- Biohazards
- Chemical Hazards
- Radiological Hazards
- Ergonomics

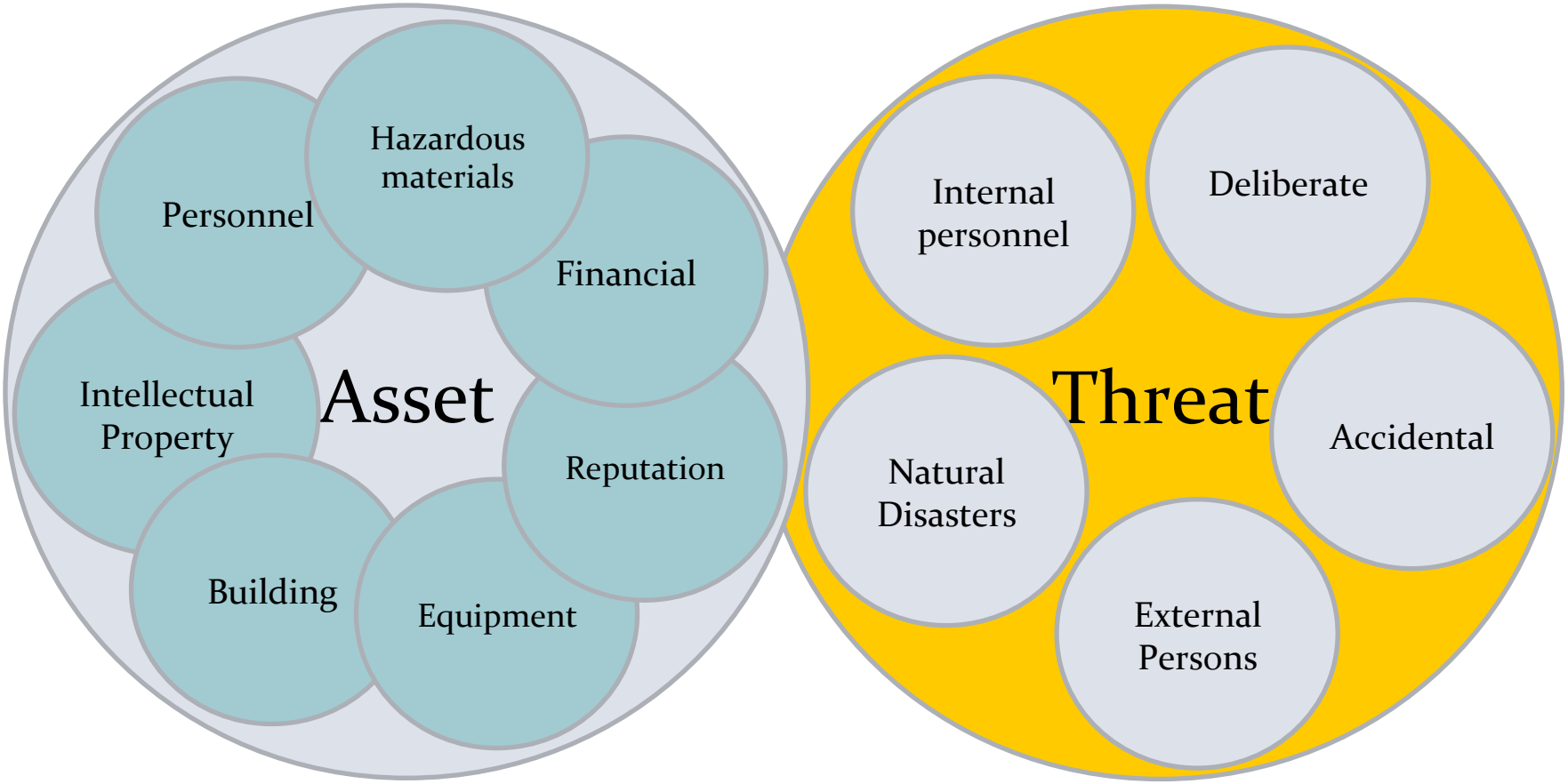
Safety

- Machine Hazards
- Energy Hazards
- Material Handling
- Confined Space

Security

- Personnel
- Material
- Assets

What are the security considerations?



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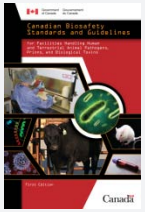
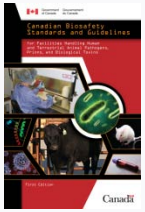
What are the safety benchmarks, guidelines, standards and regulatory considerations?

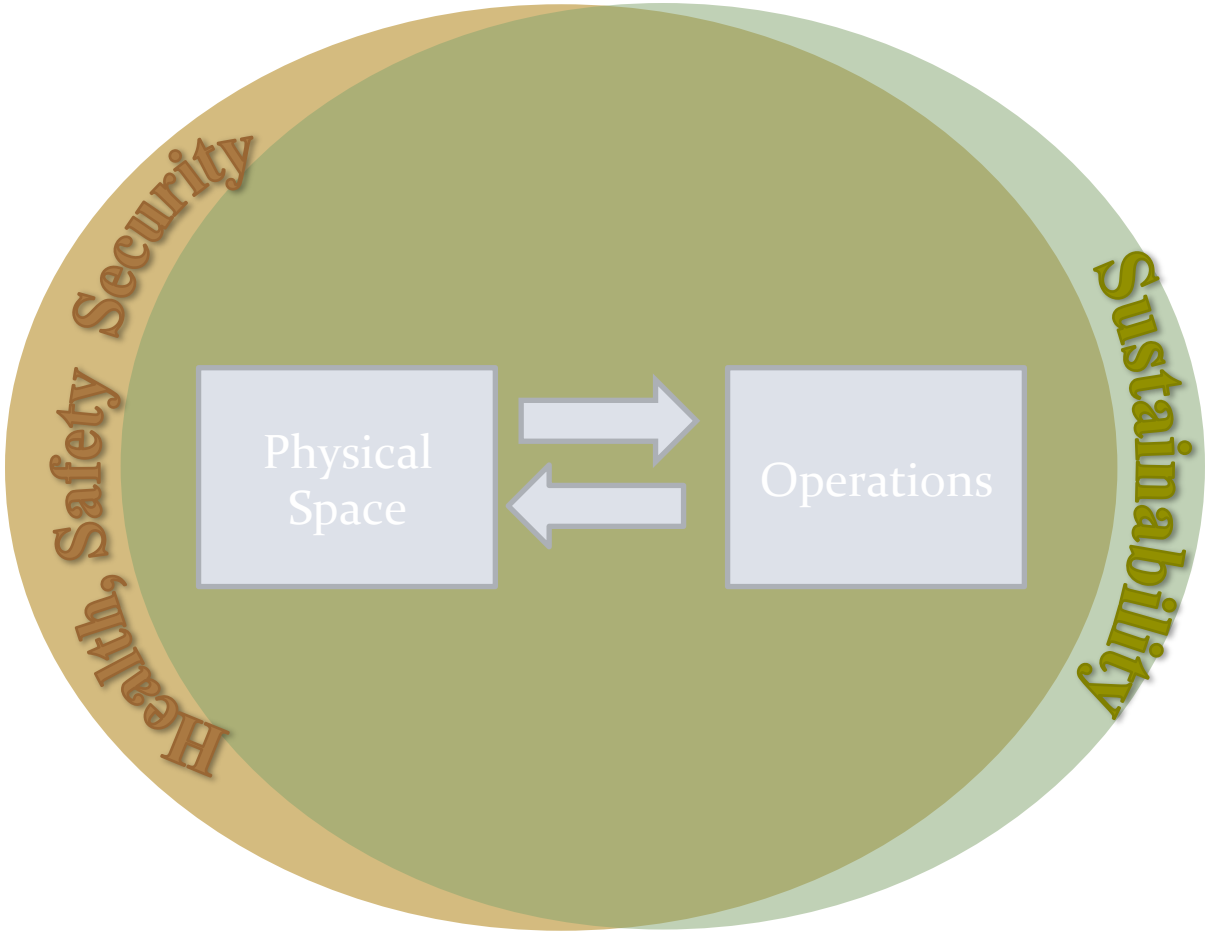
- **Laws and Regulations**: International, Federal, State, regional/ community
- **Standards:** documented rules; established by consensus
- **Guidelines:** recommended, best practices
- **Benchmark:** other institutions facilities and operations
- **Institutional Policies**

- **Be aware of impending changes to laws and regulations**.

Health: Biohazards		
Laws	Office of Inspector General 42 CFR Part 1003 Possession, Use, and Transfer of Select Agents and Toxins	Human Pathogen and Toxins Act (S.C. 2009, c.24)
Regulations	Select Agent Regulations	HPTR Draft June 20, 2014 (Canada Gazette)
Standards	NSF/ANSI Standard 49	 *Canadian Biosafety Standards and Guidelines*, 1st Ed. 2013 Update June 20, 2014
Guidelines	 *Biosafety in Microbiological and Biomedical Laboratories*, 5th Ed. 2007	 *Canadian Biosafety Standards and Guidelines*, 1st Ed. 2013

Health: Chemical Hazards		
Laws	**42 U.S.C. §4321,**National Environmental Policy Act of 1969	Canadian Environmental Protection Act (CEPA), (1999, c.33)
Regulations	EPA-New Chemicals Program; California Code of Regulations, Title 19, Public Safety, Div.1 State Fire Marshal	CEPA-New Substances Notification Regulations; Ontario Regulation 213/07 The Fire Protection & Prevention Act
Standards	NFPA (National Fire Protection Association) 45, Standard on Fire Protection for Laboratories using Chemicals	CSA Z316.5-04 (R2009) - Fume Hoods and Associated Exhaust Systems
Guidelines	*Prudent Practices in the Laboratory, Handling and Disposal of Chemicals*, National Academy Press, 1995	*Implementing a Chemical Safety Program*, CCOHS (Canadian Centre for Occupational Health and Safety)

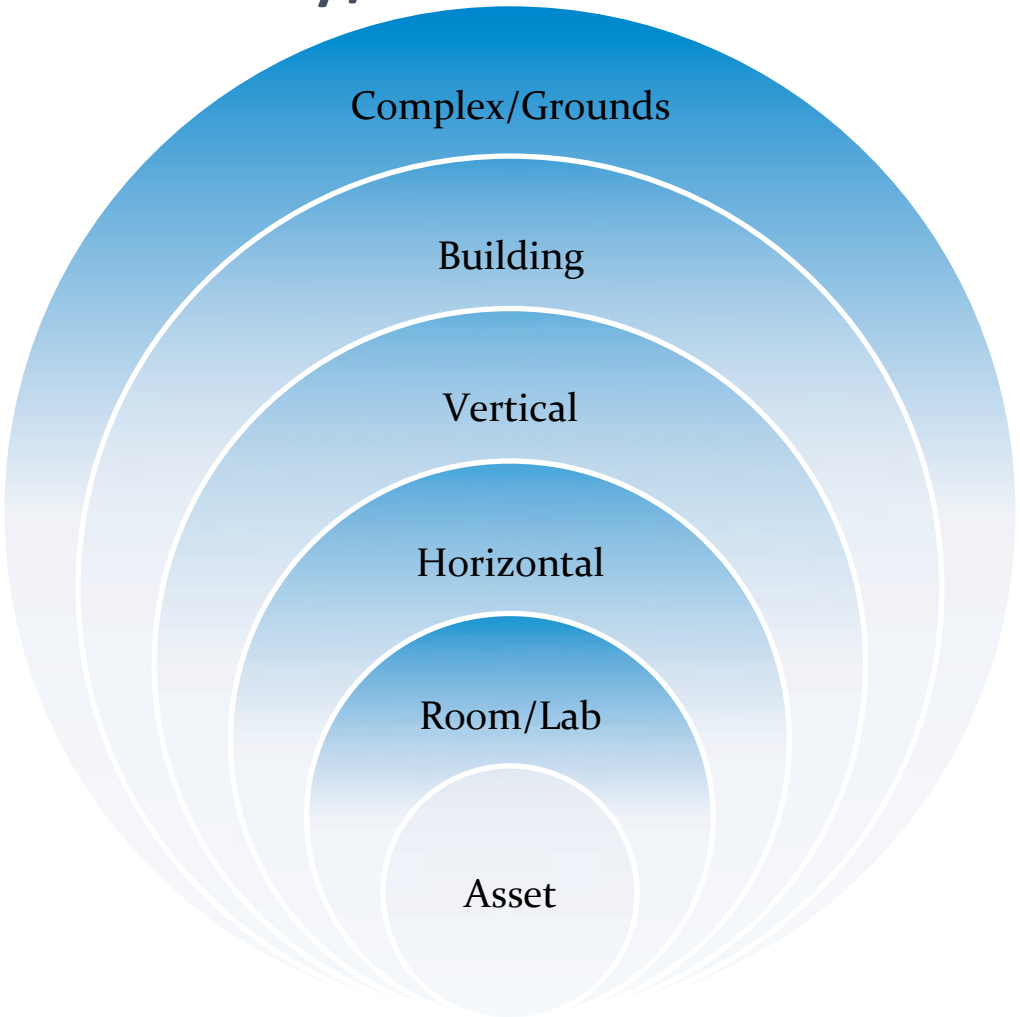
Impact of health, safety and security on physical space, operations and sustainability



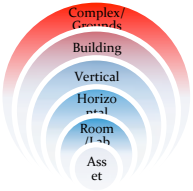
What's Next?

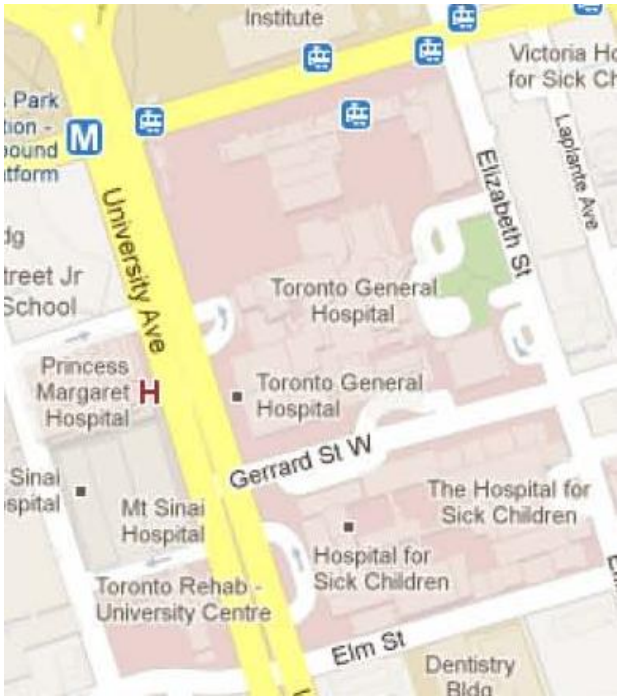
- Security & security infrastructure
- Material Handling
- Air Quality and primary containment
- Safety Equipment
- Emergency Preparedness and continuity of operations

Security: Hierarchy/Zones

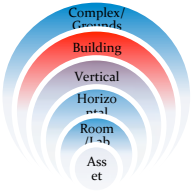


Zones and Security-Complex





Zones and Security-Building



Fire Escape

Receiving &
Public Parking
Entrance

Entrance

Multiple Level
Entrance,
building
connections

Entrance

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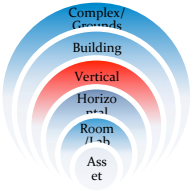
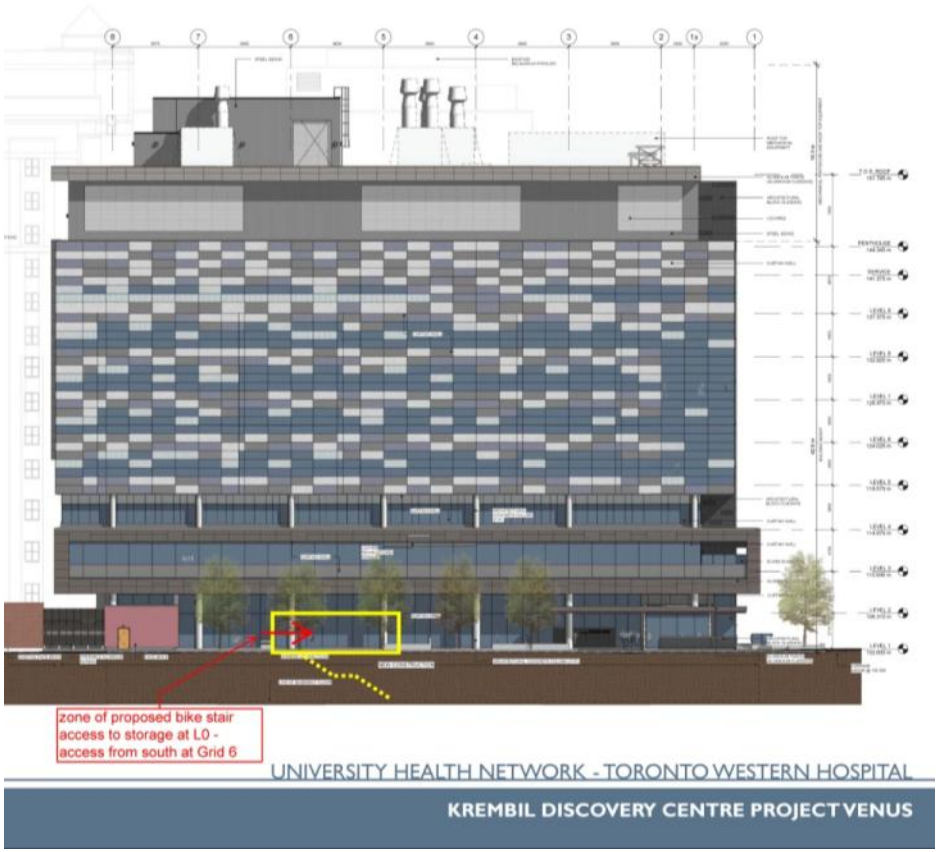
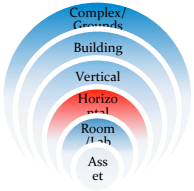
Zones and Security-Vertical





- Level: Roof
- Level: Mechanical
- Level: Upper
  - Sequestered
    - Wet Lab
    - Dry Lab
- Level: 2
- Level: 1
  - Public
    - Collaborative
    - Retail
    - Security
- Level: Basement

Zones and Security-Horizontal



- Separated by function/risk
- Access controls, flexible
- Sight lines
- Security equipment
- Workplace violence environmental assessment

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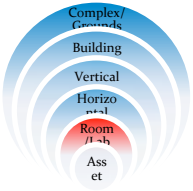
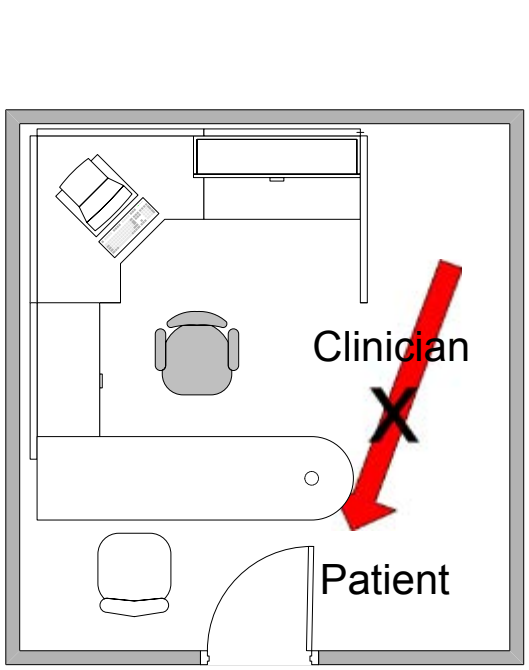
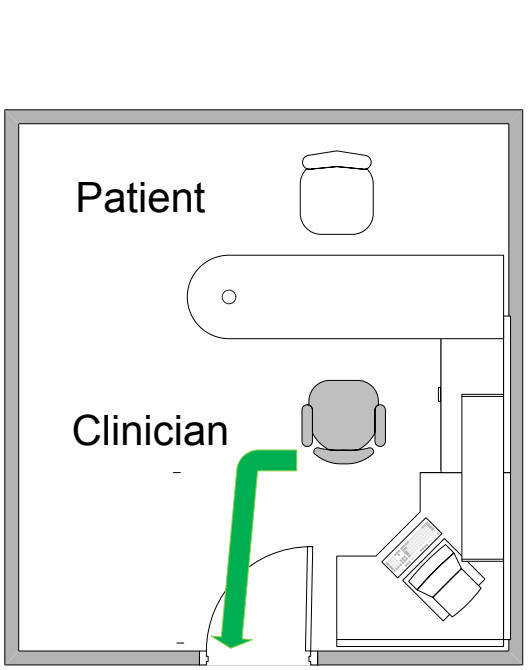
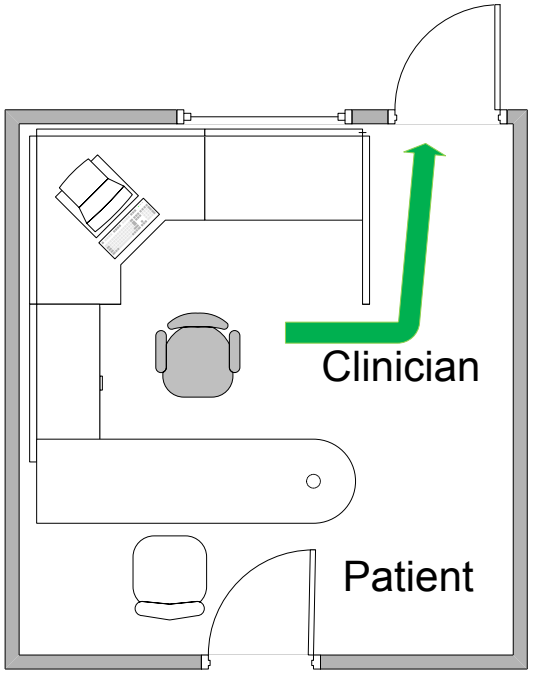
Zones and Security-Exam Room





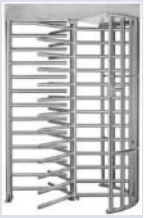




Security Systems

Barriers





Access Control






Security Equipment

Surveillance




Alarms



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Material Handling

ACTIVITY	MATERIALS	
	Non-Hazardous	Hazardous
•Supply •Internal transport •Storage •Use •Waste •Removal	Equipment Pharmaceuticals Food Laundry Paper Recycling	Equipment Pharmaceuticals Compressed Gases Biohazards Chemicals Radiologicals Sharps

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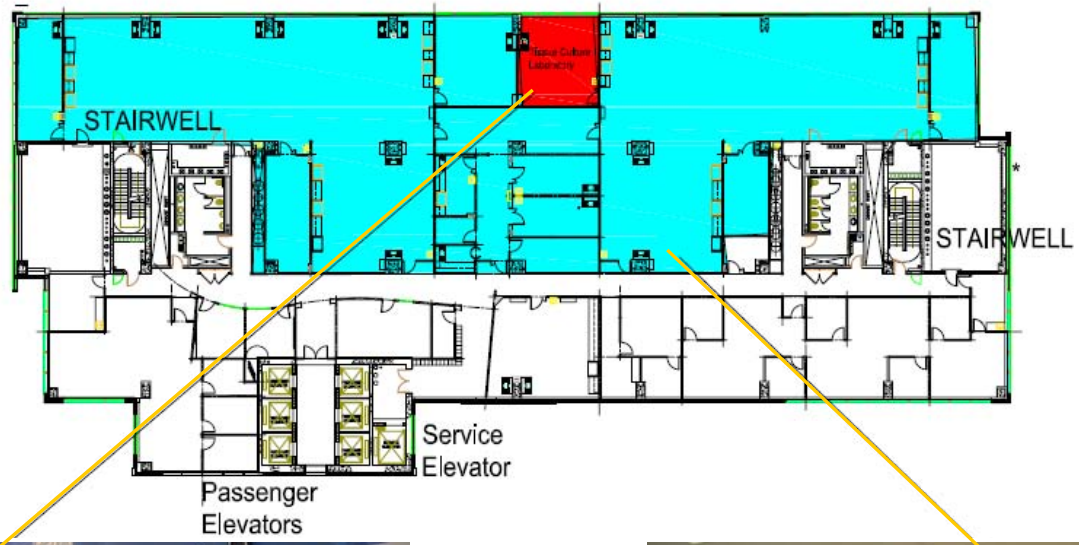
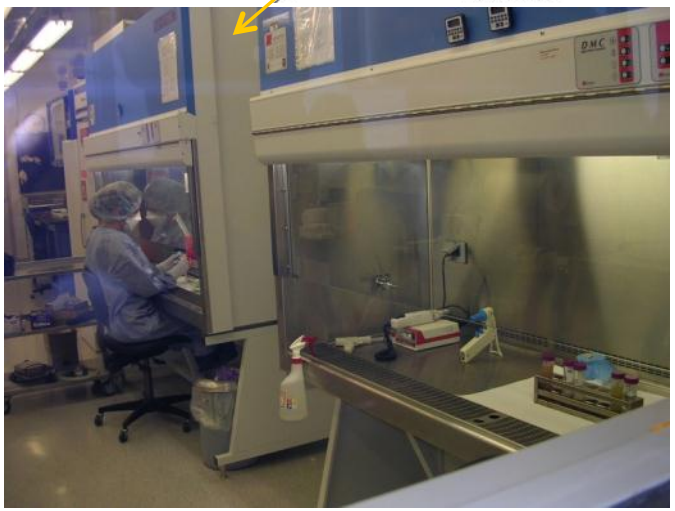
Biohazardous materials, space and operations:

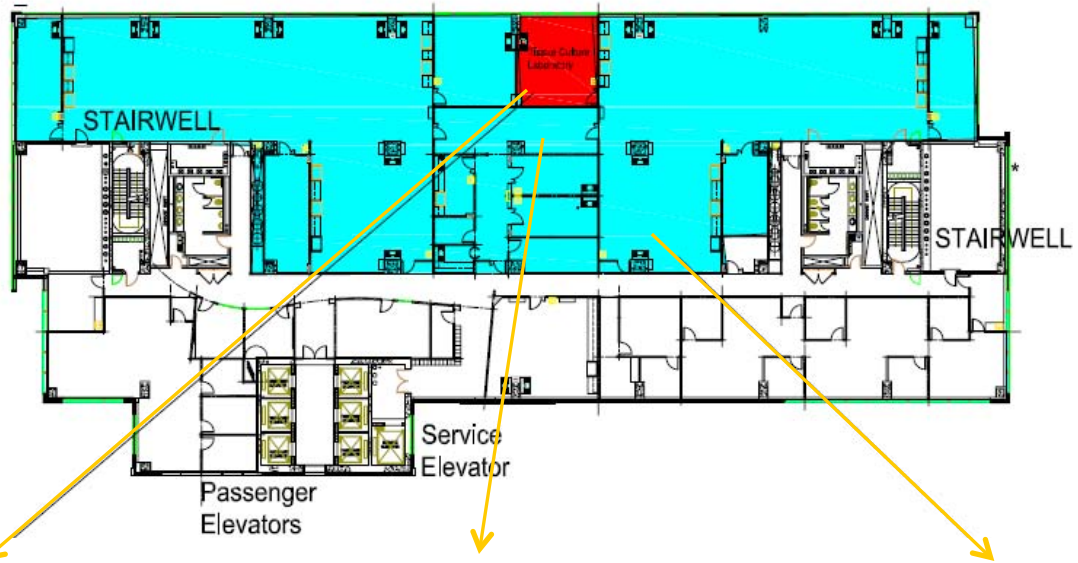
- Minimize or eliminate if possible
- Ensure controlled use and storage
- Ensure no exposure to persons
- Ensure surfaces are suitable
- Consider provisions for personal protective equipment (PPE), and safety equipment.

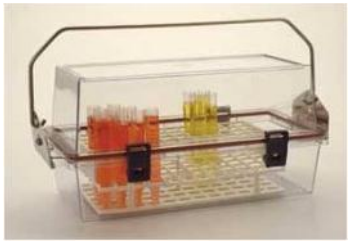
Biohazards-Secondary Containment





Biohazards-Storage





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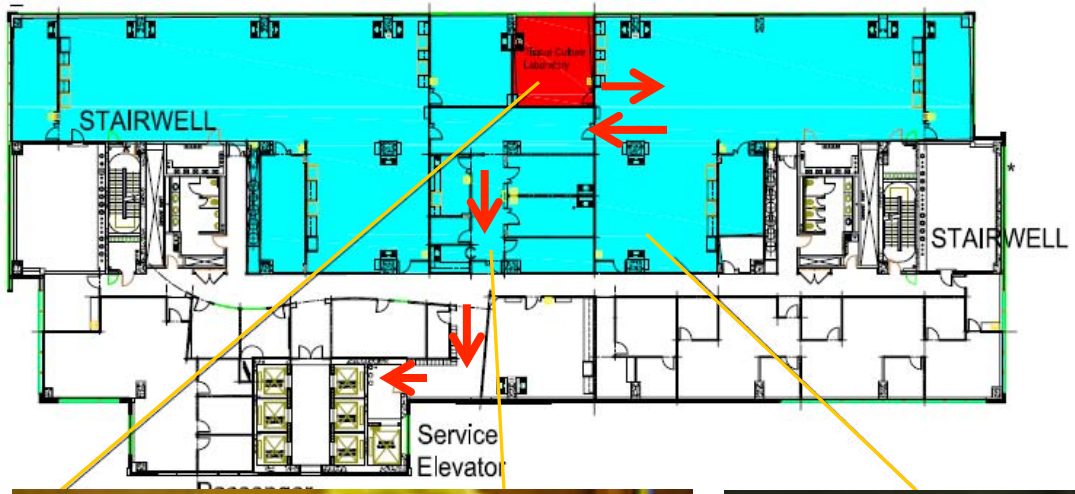
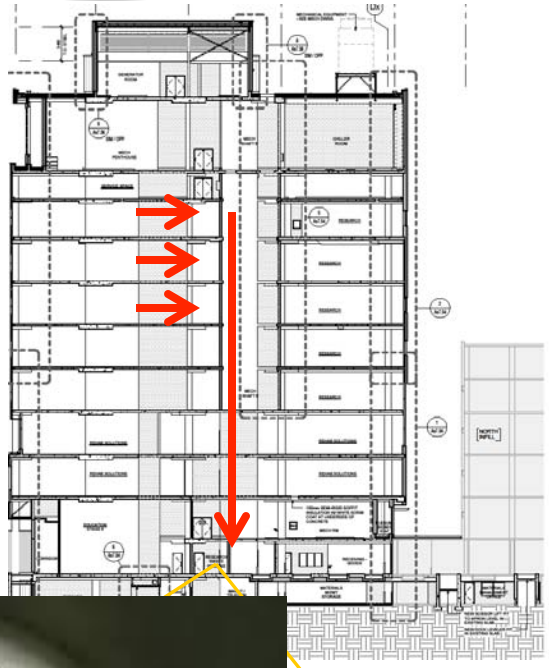
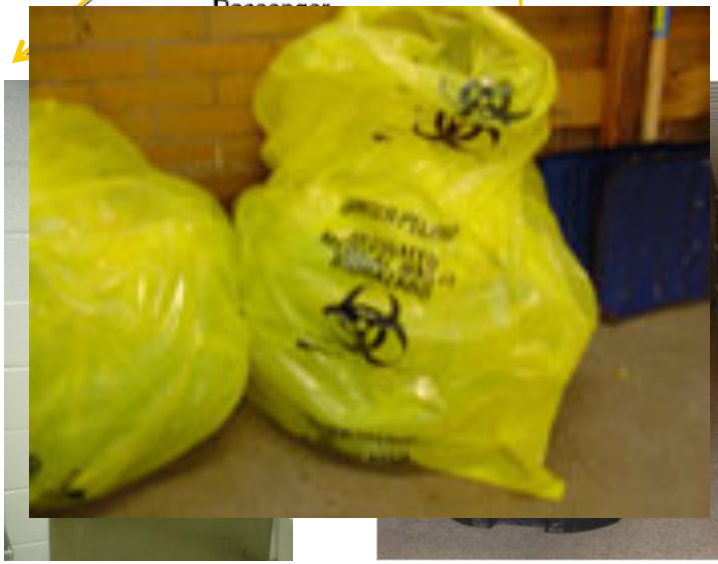
Biohazards-Waste







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Mixed Waste Streams

- Consider mixed waste streams
- Chemical
- Pharmaceutical (narcotics)
- Radiological (i.e. delay and decay)
- Sharps, etc.
- Animal carcass

Air Quality and Containment

AIR QUALITY

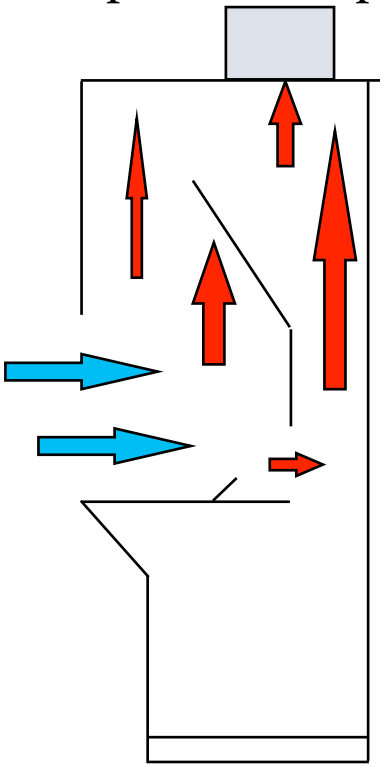
- Consider affects on persons, animals and materials
- Temperature, humidity, pressures, particulate counts, chemical fumes, aerosols, etc.
- Affected by HVAC (Heating, Venting, Air Conditioning) effector & control systems, space design, occupancy density, materials and activities

CONTAINMENT

- Primary and secondary

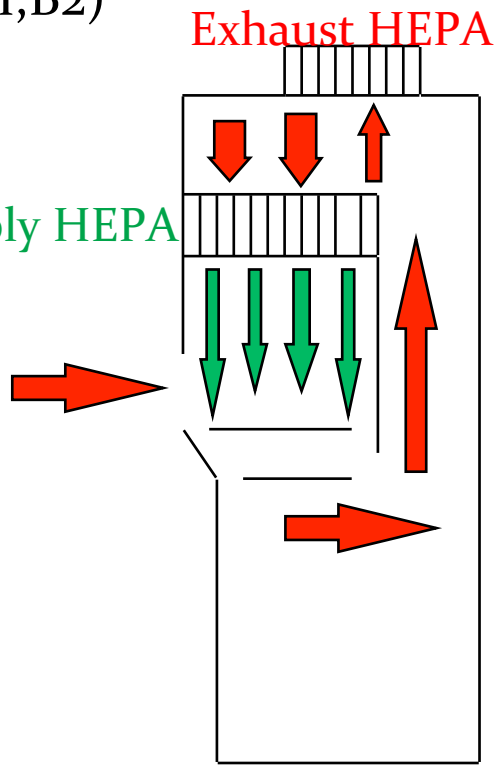
Primary Containment: Chemicals

- Fume hoods can be ducted or filter type (not ducted)
- Laminar air flow removes chemicals away from persons
- Various construction materials. (stainless steel, epoxy, poly)
- Low flow, automated sash or operational programs (“Shut the sash”)



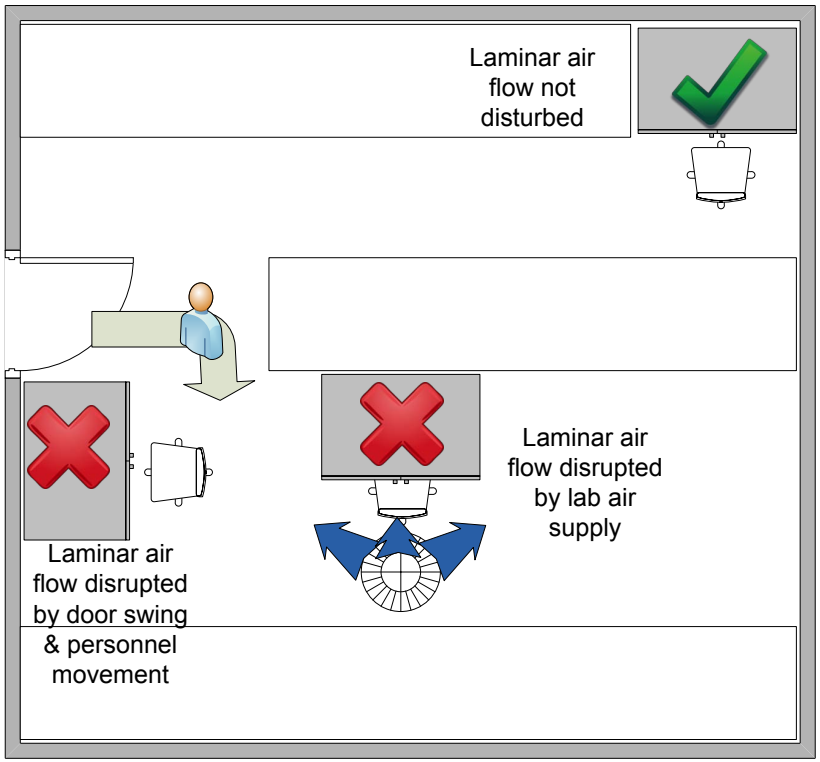
Primary Containment: Biohazards

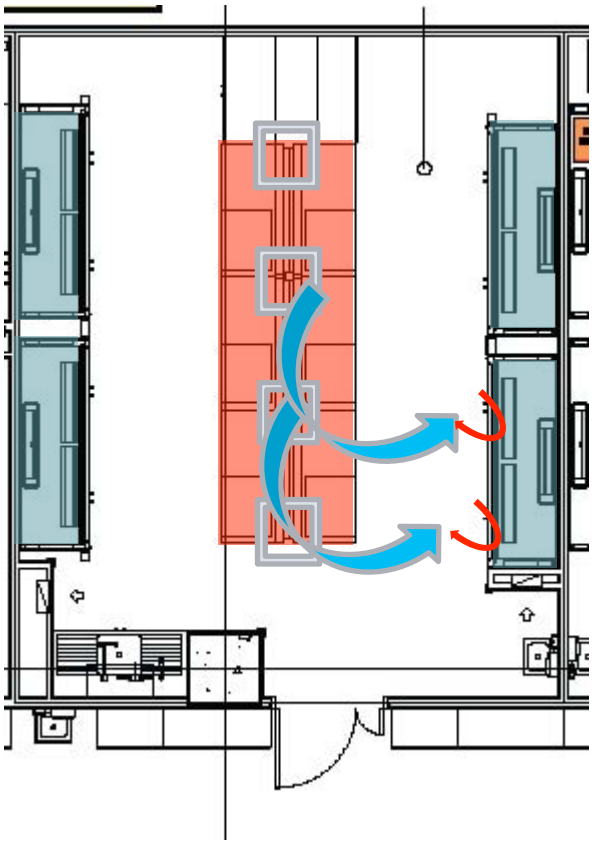
- Biosafety cabinet (BSC)
- HEPA (High Efficiency Particulate Air) filters and laminar air flow
- Various types/classes (I-III)
- Recirculating or ducted (CII,B2)
- Energy efficient models



Primary Containment & Space

- Positioning of primary containment devices should take into consideration work flows and elements that may disrupt laminar air flow of primary containment device.



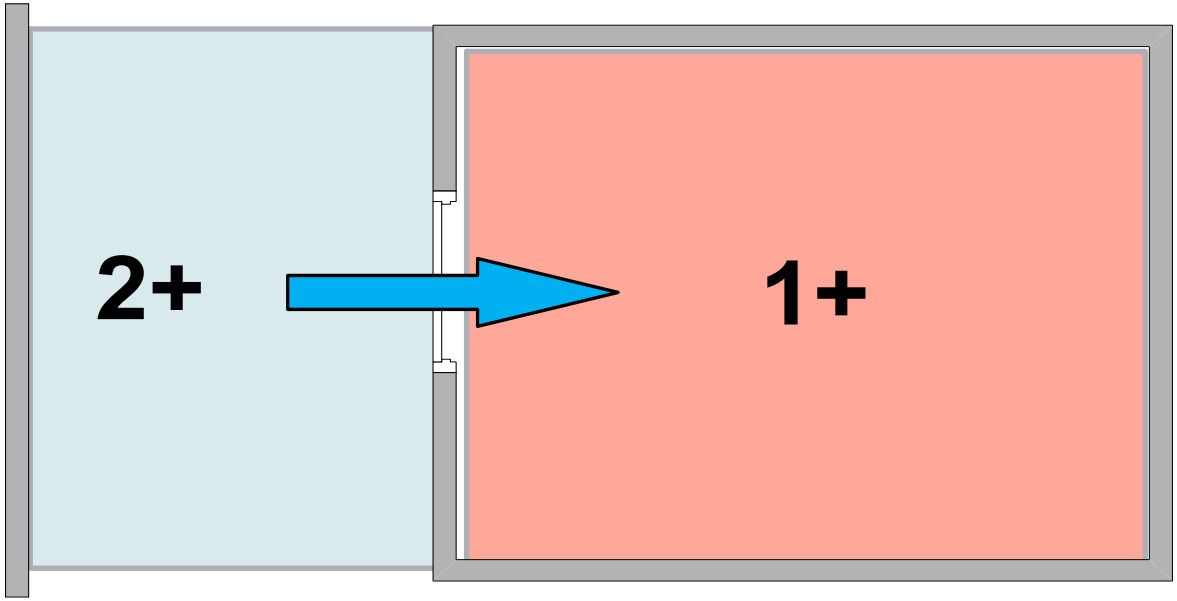


Krembil Discovery Tower

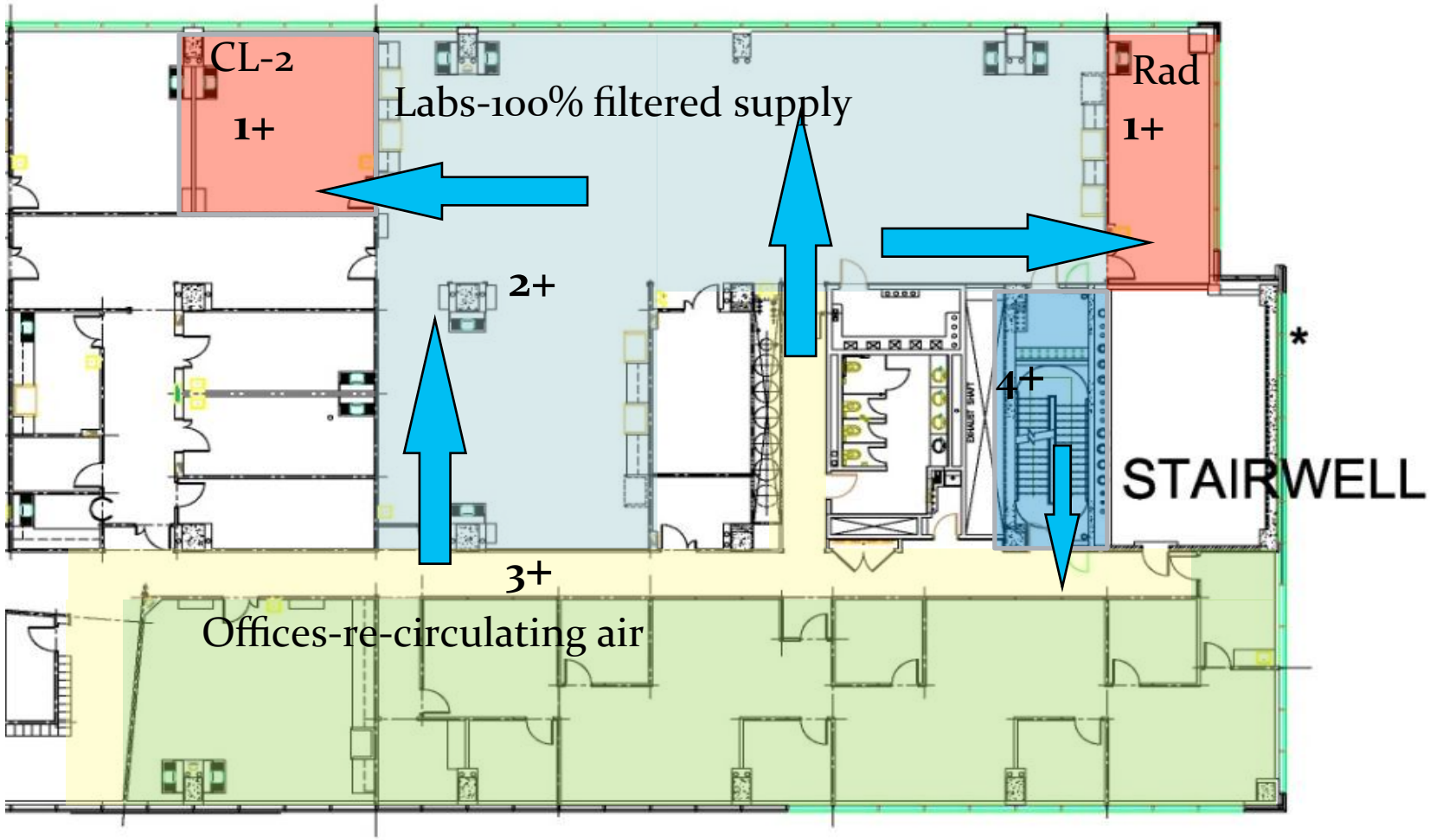
- Medicinal Chemistry Lab

Secondary Containment-Air

- Secondary containment is a method for ensuring air contaminants are not distributed to areas outside of containment zone

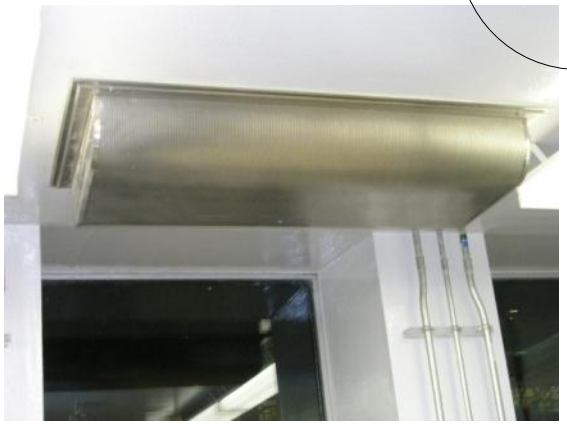


Secondary Containment –air

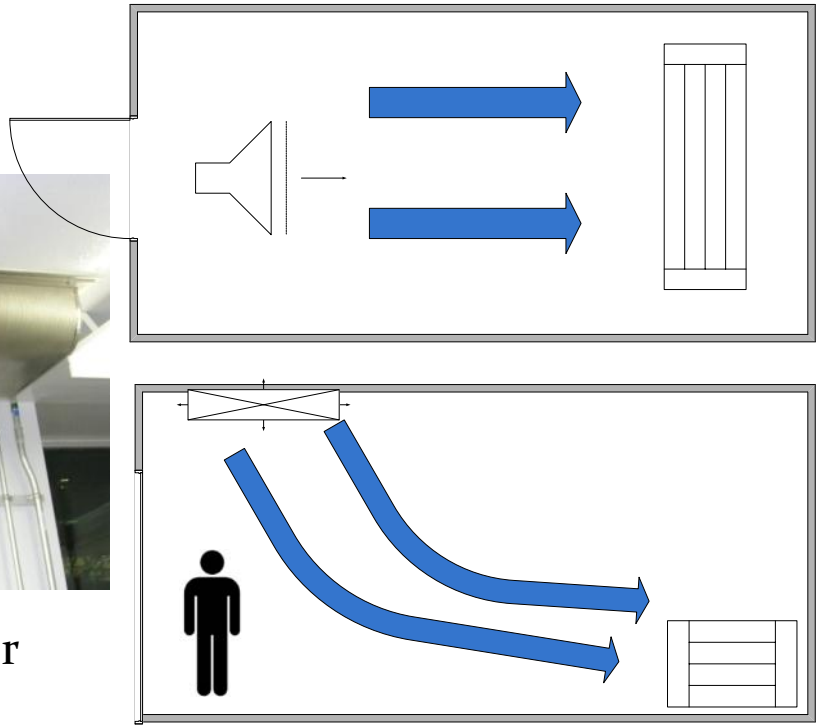


Secondary Containment-CL-2 Lab

Horizontal air flow from door to rear of lab



Air Supply Diffuser



Vertical air flow from high to low

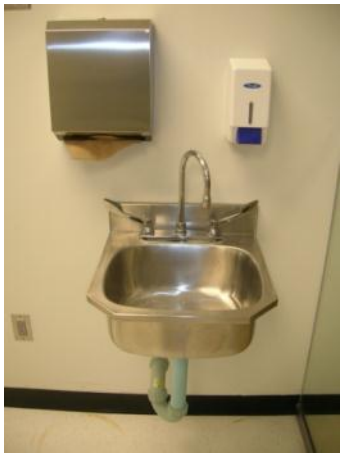
Low level Return Grill

Building Exhaust

Safety Equipment

Fire Safety Systems

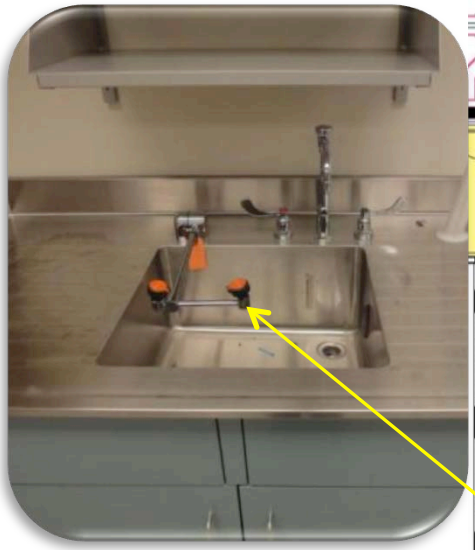
Handwashing

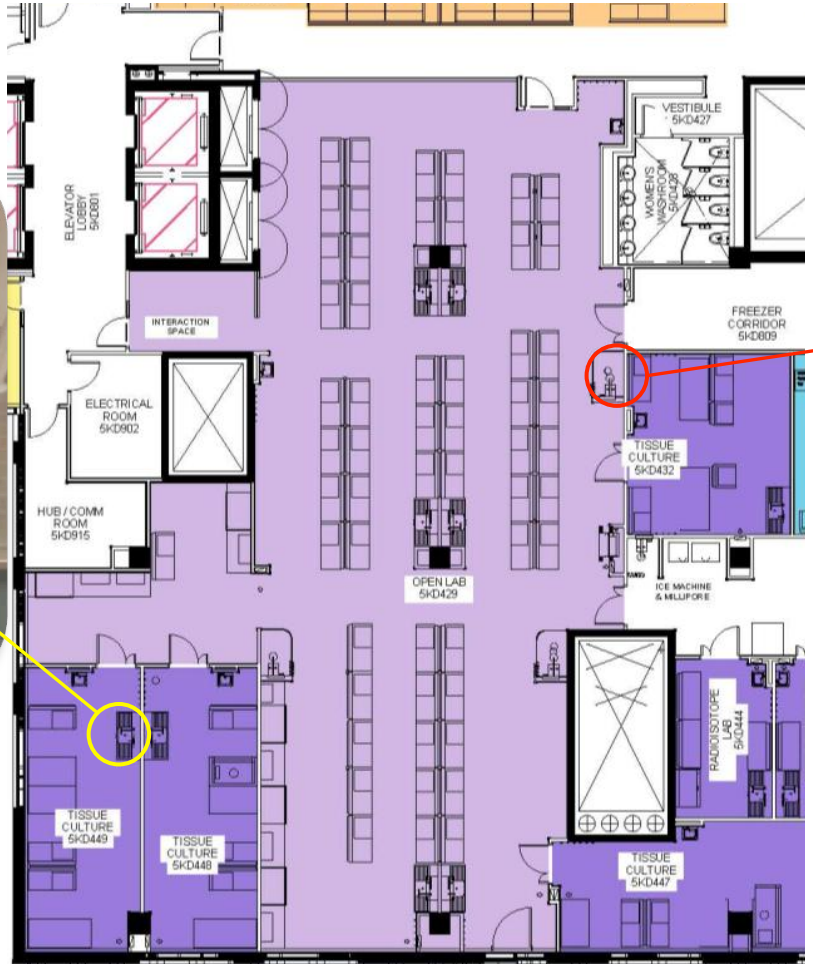


PPE

Safety Equipment

Emergency Eyewash





Emergency Deluge Shower

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Finishes-Flooring

Lighting

Emergency Preparedness and continuity of Operations

Things to consider:

- New build/new location vs existing facility
- Overarching risk assessment
- Existing Incident Management System (IMS)

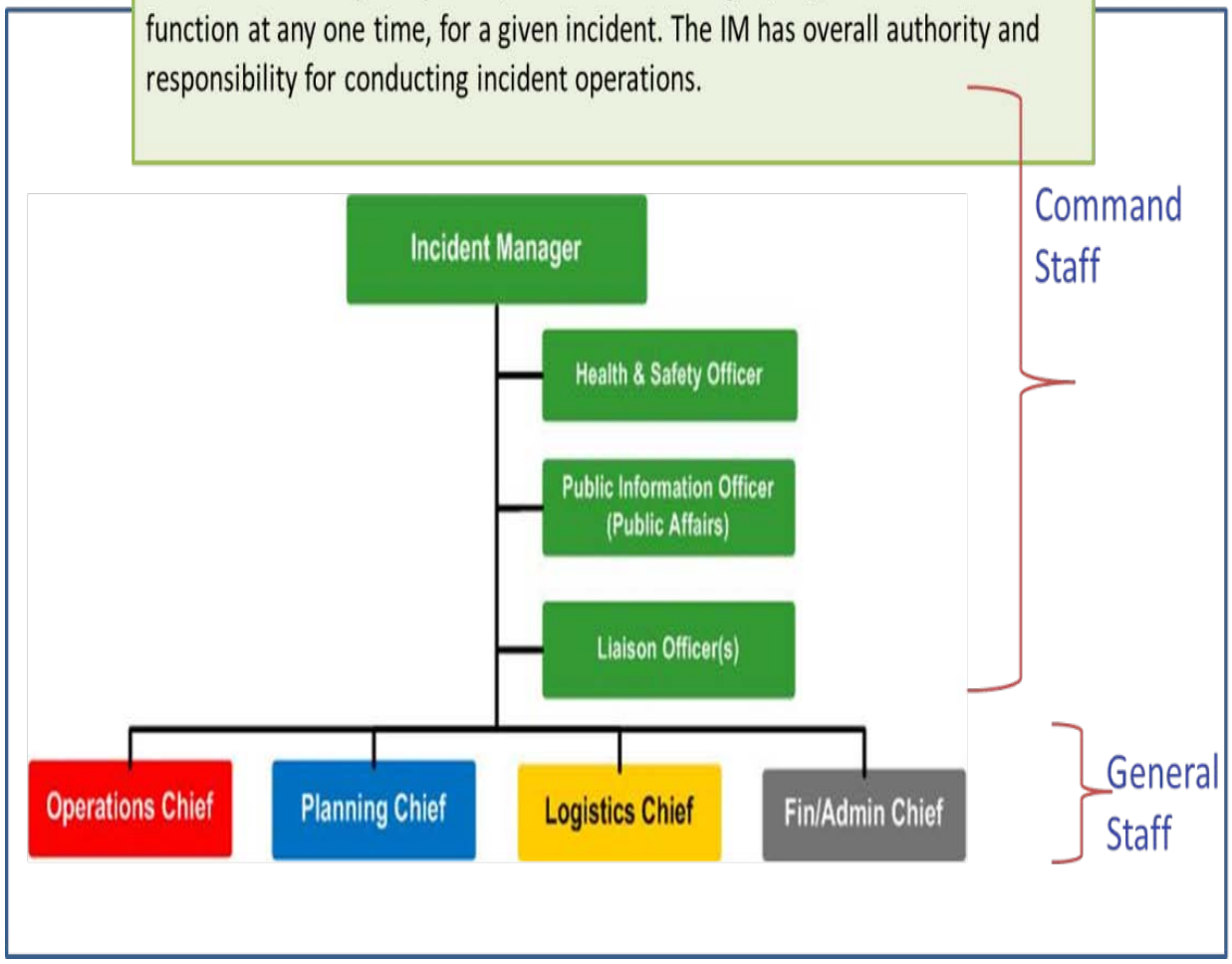
Emergency Preparedness and continuity of Operations

Risk Assessment:

- Probability of event vs severity of event vs impact
- Rural/Isolated areas vs urban
- Availability of resource to respond
- Types of events
  - Large scale (regional)/vs facility/complex
  - Natural disaster, hurricane, floods, temperature extremes etc.
  - Earthquake
  - Failure of infrastructure (power grid)
  - Terrorist Incident

Incident Management System (IMS):

The **Incident Manager** is the first and primary organizational component of the IMS structure. Only one person, the Incident Manager (IM), will exercise that function at any one time, for a given incident. The IM has overall authority and responsibility for conducting incident operations.



The IMS organization is comprised of five functional sections:

Command
Operations
Planning – *may expand*
Logistics– *may expand*
Finance– *may expand*

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Emergency Preparedness and continuity of Operations