

## Design considerations for different biosafety levels

### Planning to fit-out or refurbish a Microbiology or Biomedical laboratory?

We have compiled some key considerations to confirm at the design phase based on **Facility Design and Construction** principles of biosafety.

#### Principles of Biosafety:

- **Laboratory Practices and Technique**
- **Safety Equipment (Primary Barriers and Personal Protective Equipment)**
- **Facility Design and Construction (Secondary Barriers)**

#### COSHH1 classifies biological agents into one of four Hazard Groups (HGs)

Hazard Group 1: unlikely to cause human disease

Hazard Group 2: can cause human disease and may be hazard to employees

Hazard Group 3: can cause severe human disease and may be a serious hazard to employees; it may spread to the community, but there is usually effective prophylaxis or treatment available e.g. Hepatitis, TB

Hazard Group 4: causes severe human disease and is a serious hazard to employees; it is likely to spread to the community and there is usually no effective prophylaxis or treatment available e.g. Ebola virus, Small Pox

**Containment facilities which include Containments levels CL1, CL2, CL3 & CL4 with corresponding biosafety levels 1-4.**

### Biosafety Level 1

Well-characterized agents not known to consistently cause disease in healthy adults, and present minimal potential hazard to laboratory personnel and the environment.

- Laboratories should have doors for access control.
- Laboratories must have a sink for hand washing.
- Bench tops must be impervious to water and resistant to heat, organic solvents, acids, alkalis, and other chemicals.
- Chairs used in laboratory work must be covered with a non-porous material that can be easily cleaned and decontaminated with appropriate disinfectant.

### Biosafety Level 2

All requirements in BSL-1 need to be met, and in addition:

- Laboratory doors should be self-closing and have locks in accordance with the institutional policies.
- Laboratories must have a sink for hand washing. The sink may be manually, hands-free, or automatically operated. It should be located near the exit door.
- The laboratory should be designed so that it can be easily cleaned and decontaminated.
- Operable windows are not recommended.
- Biological Safety Cabinets (BSCs) must be installed so that fluctuations of the room air supply and exhaust do not interfere with proper operations.

- BSCs should be located away from doors, windows that can be opened, heavily travelled laboratory areas, and other possible airflow disruptions.
- Vacuum lines should be protected with liquid disinfectant traps.
- An eyewash station must be readily available.
- There are no specific requirements for ventilation systems. However, negative pressure is recommended.
- HEPA filtered exhaust air from a Class II BSCs can be safely recirculated back into the laboratory environment.

### Biosafety Level 3

All requirements in BSL-2 need to be met, and in addition:

- Separated from unrestricted traffic flow – Double door airlock
- A clothing change room (anteroom) may be included in the passageway between the two self-closing doors.
- Negative Air Pressure environment.
- Monolithic Floor systems / Sealed penetrations.
- The laboratory exhaust air must not re-circulate to any other area of the building.
- The laboratory building exhaust air should be dispersed away from occupied areas or the exhaust air must be HEPA filtered.
- Waste decontaminating – autoclave.

### Biosafety Level 4

- Remove and replace clothing / showers
- Generally separate facility where possible.
- Clean and dirty corridors.
- HEPA filtration – self-starting emergency power.
- Sealed walls, floors, and ceilings to facilitate fumigation and prohibit animal and insect intrusion.
- Drains in the laboratory floor must be connected directly to the liquid waste decontamination system.
- Redundant supply fans are recommended.
- Redundant exhaust fans are required.
- Supply and exhaust fans must be interlocked to prevent positive pressurization of the laboratory.

Source: [http://www.fefpa.org/post\\_conf\\_handouts/Summer2015/2015-FEPA%20Summer%20-%20Biocontainment-final%202015-7-8.pdf](http://www.fefpa.org/post_conf_handouts/Summer2015/2015-FEPA%20Summer%20-%20Biocontainment-final%202015-7-8.pdf)

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