

## Reasoning for Laboratory Design

**Biosafety cabinet:** The biosafety cabinet was placed in the contained area and that will be considered the BSL 3 suite within the laboratory. This is the area where all infectious specimen manipulation will take place. This area of the lab is separated from other laboratory area and should a spill occur while manipulating infectious material, exposure of will most likely be limited while the negative air pressure will more rapidly remove the suspended droplet nuclei.

**Hand sinks:** Placed in various locations through out the laboratory to be easily accessed if hands become soiled or contaminated during work and washed after removing PPE but before exiting the laboratory. It is very important to have a reliable source of running water in the laboratory and to keep each hand sink stocked with ample tuberculocidal hand soap.

**Benchtop Centrifuge (with aerosol sealed rotor):** Used to concentrate specimens during processing. If it has aerosol sealed rotor it may be located near the biosafety cabinet, within the level 3 suite to limit exposure to potential aerosols. **If it does not have such rotor it has to be placed under the BSC.** It is good to keep all equipment involved in specimen processing in the same space.

**Sonicator:** Should be placed in reagent preparation area. Empty and de-contaminate its water tank after each use to avoid contamination of the water.

**PCR Hood in Specimen preparation area:** One may increase the level of contamination control by the introduction of a PCR hood that can be placed either to the specimen preparation area or to a separate dedicated room (a fourth area). The PCR hood can be the place to add the DNA (non-viable!) that was extracted from specimens in the BSC to PCR tubes with master mix. This way the work place for DNA extraction (BSC) is separated from this work phase and the chance for contamination by previously processed specimens is lower. Never work with the viable clinical specimens in the PCR hood, only extracted DNA can be handled here! The UV light in the PCR Hood in conjunction with appropriate cleaning will destroy contaminant DNA.

**PCR Hood in Reagent preparation area:** One may use a PCR hood to prepare the master mix for amplification to increase the level of contamination control. Optional.

**PCR clean freezer:** Should be located in the **reagent preparation area** to store the PCR reagents (components of the master mix). It should also be located away from sources of intense heat such as autoclaves. Keep in mind that refrigerators and freezers can be a big heat producer and the more of these units are in a room the more air conditioner unit that may be needed to offset the heat production. Make a special effort to keep the filters clean to improve longevity for refrigerators and freezers.

**DNA extract freezer (-20 or -80°C):** Should be located in the **specimen preparation (BSL 3) area** to store DNA extracted from clinical specimens.

**Specimen refrigerator (4-8°C) and/or freezer (-20 or -80°C):** Should be located in the **specimen preparation (BSL 3)** area to store clinical specimens.

**Reagent refrigerator (4-8°C):** Should be located in the **amplification/detection area** to store area specific reagents.

**Thermocycler:** Should be placed in amplification/detection area.

**Twincubator:** Should be placed in amplification/detection area.

**Air conditioner units:** These are usually single units and are not generally incorporated into a centralized system. When deciding where to place the units special attention should be paid to the direction of the air flow and especially when in close proximity to biosafety cabinet. Biosafety cabinets are very sensitive to disruptions in the airflow and disruptions need to be minimized in order for the BSC to work properly. Attempt to angle the vent or louvers toward the ceiling to disperse the air current. Turn off the unit in the reagent preparation unit when working to avoid contamination of reagents.

**Autoclave:** The autoclave is located in the Anteroom for autoclaving lab waste generated in the different areas of the laboratory. Please note that autoclaves, by nature, generate a great deal of heat and should be located far away from the refrigerator/freezer. If the freezer and autoclave are located near each other the excess heat produced by the autoclave will unnecessarily tax the refrigerator/freezer motor, decreasing the life of the freezer. The floor model has been placed under an Air conditioner and an extractor fan that will work both to exhaust the heat and steam produced by the autoclave and help maintain negative air pressure.

**Cart:** Should be conveniently located in the laboratory in order to be readily available to transport specimens, cultures, or waste within the laboratory. When transporting anything infectious using a cart is always much safer than carrying.

**Extractor fans (EF):** Extractor fans are placed in the laboratory to create negative air pressure. The air pressure should be the most negative in the areas where the most potentially infectious work is performed. There is also an extractor fan placed near the autoclave to aid in exhausting excess heat from the autoclave. These extractor fans were placed in the outside wall so that they will not vent into a corridor. Ensure the area where the exhaust is vented is not a walkway or high traffic area and that there are no air intakes near by that will pull the exhaust back into the building. Please note that there is no extractor fan in the Reagent preparation room. The negative pressure generated by an extractor fan may bring in potential contaminants from outside when opening the door! Since infectious material is not processed in this room no negative pressure is needed here.

**Lab coat (BSL2 work) racks:** Placed at the entrance to the laboratory, near the hand sink so that lab coats can be donned before entering the laboratory and removed when

preparing to exit the lab before hand washing. There is also a lab coat rack near the entrance to the BLS3 suite. This allows for the lab coat to be hung up while the technologist is wearing the lab gown that is used for BLS3 work. It is good to change shoes both in the BSL 3 and at the reagent preparation area to avoid exiting the BSL 3 area with contaminated shoes or to avoid the contamination of the PCR clean reagent preparation area.

**Lab gown (BLS3 work) rack:** Placed near the entrance to the BSL3 suite, this way appropriate PPE for level 3 work can be donned before entering the BLS 3 suite and removed and hung up and stored upon exiting (if lab gowns are not disposable).

**Biohazard waste containers:** Placed conveniently through out the laboratory near work stations, where biohazard waste is generated and near doors where gloves can be disposed of before exiting an area. Pipettes, glass slides, and other sharps need to be placed in special sharp biohazard waste containers that are puncture resistant. All biohazard waste should be autoclaved, chemically disinfected or incinerated to ash.

**Eye wash (EW):** Is located near the sink in the Anteroom so that in the event of use it can be drained into the sink and will need to be connected to consistent clean water source or be a station that contains a sealed bottle of eyewash solution and is readily replaced when it expires.

**Fire extinguishers:** Placed in easily accessible locations in the laboratory and all laboratory employees are aware of their location and operation in the event of a fire.

**Biohazard spill kit:** It is good to have two kits; one should be located in the BSL3 area to clean spills that happen inside the BSC or inside the contained area. The other should be located outside the laboratory so that in the event of a spill and all personnel have exited that laboratory and after the lab has been vacated for the required amount of time, the PPE, disinfecting equipment, and instructions located in the spill kit can be used to safely return to the laboratory and clean up the spill.

**Emergency shower:** The emergency shower is used if caustic chemicals come into contact with a large portion of a workers body and a large area is in need of flushing. It is not necessary for the shower to be in the laboratory but is recommended to have it in close proximity to the laboratory in the event of an emergency.