Biomedical laboratories should be designed to address the hazards that are inherent or anticipated in such facilities. The design team must address the following major hazards that are encountered in biomedical laboratories:

1. Biological: etiologic agents, clinical and other materials that may contain etiologic agents, biological toxins.

2. Chemical: carcinogens, mutagens, teratogens, toxic chemicals, flammables, compressed gases.

3. Physical: lasers, magnetic fields, high voltage, ultraviolet light, high noise levels, electromagnetic fields, vibration.

4. Radioactive: radionuclides, equipment that produces ionizing radiation.

The methods of handling these hazards in the laboratory are critical to the laboratory design. Therefore, the risk of each hazard must be individually assessed during the design process and appropriate measures must be taken for proper storage, handling and disposal of hazards. Regulations, guidelines and standards developed to address these concerns are referenced throughout this document. All references are listed in Appendix A.

Biological Safety Level 2 & 3 (BL2/3) laboratories are those in which work is done with a broad range of indigenous, moderate-risks infectious microorganisms that are normally present in the community and considered by NIH/CDC to be Class 2/3 pathogens (reference CDC/NIH Biosafety in Microbiological and Biomedical Laboratories (BMBL)). Biological safety cabinets may be required when procedures with the potential of creating aerosols are conducted. Cabinets in BL2 laboratories are usually not vented. Cabinets in BL3 laboratories are however recommended and may depending on the pathogens be required. Because research with Class 2 or 3 pathogens sometimes involves the other major hazards listed in the introduction, all aspects of safety must be coordinated in the design of the laboratory.

This design guide will focus on the bio-safety considerations for a BL2 laboratory. If radionuclides are used, specific guidelines for safe containment may be obtained from the Radiation Safety Office (2-3476). If volatile solvents, corrosive chemicals or any of the physical hazards are involved, safety guidelines and relevant regulations for safe containment may be obtained from the University Environmental Health and Safety Office (2-6816) and the St. Louis City Fire Department.

Aerosol: a suspension in air of liquid or solid particles typically less than five microns in diameter.

Class II Biological Safety Cabinet (BSC): a ventilated enclosure for personnel, product and environmental protection. It is characterized by a protective laminar flow air barrier and HEPA-filtered supply and exhaust air. The purchase of new biological safety cabinets is covered under specification requirements.

Class II, Type A BSC that recirculates the exhaust air into the laboratory space after filtration.

Class II, Type B BSC: a BSC that exhausts air to the outside, after filtration, via sealed ducts and an external fan. There are three exhaust configurations: II-B1-70% exhaust, II-B2-100% exhaust and II-B3-30% exhaust.
Containment: a safe method of managing infectious agents within the laboratory environment to prevent their escape from the laboratory.

EHS: Washington University School of Medicine Office of Environmental Health and Safety.

Decontamination: a procedure that eliminates or reduces microbial contamination (or toxic substances) to a safe level with respect to transmission of infection (or toxicity).

Regulations: design requirements mandated by a governmental agency through formal legal constructs.

Guidelines: design recommendations detailing best practice, issued by governmental units (usually federal).

Standards: design recommendations published by recognized national safety organizations (e.g., National Fire Protection Agency (NFPA), American Biological Safety Association (ABSA), National Sanitation Foundation (NSF)) as being the best practice. Standards may be incorporated into governmental codes.

PART 3 – EXECUTION

END OF SECTION