Design Guideline 5.12
Lab Design and Safety

Scope

Lab Design and Safety addresses safety related design considerations for layout and space separation, security, chemical use, safety equipment / supplies, and utilities. Guideline is applicable to both teaching and research laboratories. The intent of this guideline is to illustrate some basic health and safety elements that will contribute to providing a safe environment for researchers to conduct their work. Secondary intent is to allow flexibility for continued safe use as research changes and evolves.

Research takes many forms and involves different risks. The scope of this document is not intended to be comprehensive. It is expected that this document will serve as a springboard for project team discussions that seek to anticipate and evaluate health and safety hazards of planned research. Use this information to design research space in a way that minimizes hazards and facilitates consistent compliance with operational safety requirements. Safety discussions during the design process will contribute to a user education and a culture of safety.

Related Sections

U-M Design Guideline Sections:

5.2 Animal Facilities
6.0 DG 101400 Signage
6.0 DG 115313 Laboratory Fume Hoods, BSC's, Specialty Hoods and Acid Flammable Cabinets
6.0 DG 123553 Laboratory Casework
6.0 DG 132100 Controlled Environmental Rooms
6.0 DG 230030 Laboratory Ventilation Design

U-M Master Specification Sections: (A digitally accessible version is pending; please email AEC-Digital Accessibility Support if assistance is needed)

7.0 MS115313 - Laboratory Fume Hoods

Other Related Documents: Comply with these documents and others when applicable

ANSI Z358.1 American National Standard for Emergency Eyewash and Shower Equipment CDC-NIH Biosafety in Microbiological and Biomedical Laboratories
Department of Agriculture, ARS Facilities Design Standards
Guide for the Care and Use of Laboratory Animals- American Society for Accreditation of Laboratory Animal Care
MIOSHA
National Institutes of Health Design Requirements Manual for Biomedical Laboratories and NFPA 45 Standard On Fire Protection For Laboratories Using Chemicals
"Safe Handling of Radioactive Materials", National Council on Radiation Protection (NBS Handbook 92)

Definitions:

- **Laboratories:** A room equipped for scientific experiments, research, or teaching, or for the production of drugs, chemicals, or other research materials. This includes both wet and dry lab space as well as lab support.
- **Non-lab areas:** Rooms and areas used for research data analysis, documentation, and discussion in which physical research materials are not used or stored. These typically include offices, researcher desks, meeting rooms, break rooms, etc.
- **PPE:** Personal Protective Equipment, requirements are based on specific research hazards.

Laboratory design requirements:

Layout and space separation:

- Provide physical separation between lab areas and non lab areas.
    - Individuals in a laboratory must wear appropriate attire and PPE. Physical separation of allows researchers to remove PPE while in non-lab areas.
    - It is prohibited to store or consume food/drink, apply make-up, or chew gum within laboratories. This includes desk areas in an open lab. Physical separation of desks from the lab allows for food/drink consumption.
    - Physical separation consists of a partition, floor to ceiling with doors and closers. If a visual connection is desired for safety or operations: consider glass partitions, borrowed lites etc.
    - Some laboratory areas may need to be separated from other research activities depending on research activities.

Access, security, and egress:

- Evaluate security level required for each lab space with user groups. Coordinate with Design Manager.
    - Consider levels of security from public to private. Sequence security from public corridor (low level security), to researcher work space (mid-level security), to lab enclosure (higher security).
- Arrange circulation to allow access to and egress from non-lab areas without going through lab areas.
    - This minimizes lab access and need for PPE.
- Arrange egress pathways to progress from higher hazard to lower hazard areas. Consider placement of fume hoods, equipment, furnishings, and cart storage when laying out egress pathways.

Safety equipment and supplies:

- Provide wall space on corridor side adjacent to lab entry doors for posting laboratory safety signage.
- Provide lab space for a safety station at main entry. Contents of safety station will vary but minimally includes PPE, spill kit, and first aid kit. Provide consistent

- location in each lab to encourage researcher use and facilitate safe emergency response.
- In each lab room (separated by a door) that utilizes animals or chemical, biological, or radiological materials, provide hand wash sink with space for adjacent soap and paper towel dispensers.
    - It is important that hands are washed when leaving a laboratory to avoid spreading contaminants. Consider locating sink near egress point.
- Provide emergency shower and eyewash stations as required by MIOSHA regulations and letters of interpretation. Review optional related provisions with user and Design Manager including shower curtains, floor drains, and flow alarms.
- Provide wall phone or emergency hands free phone in each lab or lab suite, to accommodate emergency call. Relying on cell phones is not acceptable.

Chemical use, storage, and disposal:

- Obtain chemical types, concentrations, quantities, and storage needs for each laboratory space early in design phase to inform building planning and related requirements. Coordinate with Design Manager.
- Provide adequate chemical storage that physically separates incompatible chemicals/gases. Do not locate chemical storage shelves above sinks. Do not locate toxic or corrosive liquid storage above bench top.
- Provide adequate space and related provisions for waste materials / containers expected. Consider related safety requirements such as shielding, security, flammability, and separation of incompatible waste materials.
    - Chemical, biological, and radiological wastes are required to be stored in the lab in which they are generated, not in centralized accumulation areas. They are periodically collected and sent to a disposal/ recycling center.
- Although chemical hygiene plans prohibit dumping chemicals into the drain, provide a chemical resistant lab waste system connected to lab sinks, fume hood cup sinks, and similar plumbing fixtures in labs using chemicals.
    - The intent is to prevent damage to piping from spills or accidental discharges.
    - The lab waste system shall normally combine with sanitary waste near the point where sanitary waste exits the building.
- For laboratories using compressed gases provide designated areas for cylinders in use and associated restraints. Separate incompatible gasses and provide ventilated cabinets as required by code**.**
    - Review delivery, staging for spare / used cylinders, and pick-up requirements with researcher, building manager, and Design Manager to ensure that adequate routes and spaces are provided.

Utilities:

- Control lighting with occupancy or vacancy sensors wherever possible, but provide manual switches in areas where the sudden loss of light could be hazardous. Utilize lighting control occupancy sensors to control lab ventilation to conserve energy where approved by OSEH.

- Provide duplex receptacles adjacent to doors in labs and lab support areas for housekeeping. Connect to normal power circuits separate from lab receptacles. Multiple housekeeping receptacles may be on the same circuit. Label as "housekeeping".
- Provide sufficient fire alarm speakers to ensure sound detection when equipment and fume hoods are operating. Design fire alarm strobe light locations and intensities to ensure strobe detection despite visual obstructions such as island benches and suspended lab storage and services.

Renovation of existing laboratories:

For renovation of labs the Design Professional should evaluate if any items of Lab Safety Design Guideline can be incorporated.

Laboratory renovation projects face multiple challenges related to the limitations of existing space and infrastructure, as well as established practices of the building occupants. Physical limitations may dictate the extent to which this guideline is followed. It is expected that the AE, in conjunction with OSEH and the Design Manager will lead discussions, with the user, related the safety and operational impacts of design decisions. At minimum, the following topics should be addressed and documented as a part of the OPR/BOD:

- Relationship between areas for lab and non-lab activities
- Lab access, egress, and security
- Hazardous material use, storage, and disposal
- Safety equipment and supplies
- Compromises in designed functions and features due to existing condition limitations.
- Risks associated with dependence on existing reused systems and utilities

Separation between lab and non lab spaces will affect operational uses. Design Manager shall facilitate discussion between Design Professional, OSEH and users to develop a design that meets the goals of the users and the safety requirements of OSEH. Level of separation required may differ based on lab function.