LABORATORY DESIGN GUIDELINES

York University

These guidelines are designed to assist all of those involved in laboratory design, construction and renovation projects to meet the applicable laboratory standards at York University. The guidelines refer to a number of YU standards as well as relevant external standards and regulations. These standards/regulations must be referred during design/planning stage for details on specific requirements not listed in these guidelines for the practicality reason.

It is recommended that a detailed assessment of the procedures/activities, hazardous materials involved in the lab(s) be undertaken for a proper laboratory design. Furthermore, involving occupants and/or the lab users in this process would bring benefits to the process and enhance laboratory design.

Comments or recommendations to improve this document and its application are welcomed.

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CONTENT

1. General

Note: Refer to Section 5 and 6 for laboratories using radiological or biological agents.

1.1 Layout

a) When multiple laboratory working areas are located in the same space, high hazard working areas, normally dirty, should be located near the exterior wall and low hazard working areas, normally cleaner, should be located near the corridor.
b) Intensive laboratories should be located at top levels and undergraduate laboratories located on lower levels.

1.2 Plumbing

a) At all times, applicable codes shall be respected.
b) Piping systems shall have materials selected for resistance against the types of chemicals proposed to be used within each specific lab.
c) On each floor, access to vertical piping chase shall be made easy by means of access doors.
d) All piping serving laboratories should be in horizontal pipe chases, located in the wall behind cabinets or above benches for easy access. They should not be integrated within cabinets.
e) Access to the horizontal piping chase should be possible throughout its full length by means of removable back panels within cabinets.
f) Piping should be layout in a manner that future connections will be easy to make.
g) Shut off valve should be located on each floor
h) Drainage piping for laboratories should be made of Polypropylene (brand name Blueline or Brownline), Polyvinylidene Fluoride (PVDF) (brand name is Pegas Superblue) or glass.

1.3 Sinks

a) Lab sinks shall be selected to be resistant to the chemical proposed to be used within. Accepted materials are stainless steel 316L, epoxy and plastic.

1.4 Laboratory Benches & Cabinets

a) Users must be consulted in order to determine their requirements.
b) Benches should be proper conventional depth to allow easy access to back section.
c) Shelf above bench top surface should be able to withstand the weight of equipment and products that it will support.
d) Cabinets above and below counter shall be manufactured from materials that will withstand the weight of equipment and product being used. Coordination with the user is imperative.
e) All cabinets shall have removable back for easy access to piping, conduit and wire (electrical and data/communication)

f) Cabinet door hardware must be equipped with proper knuckles door hinges, locks. Doors must be able to open to 180 degrees.
g) Drawers shall be full extension, ball bearing type. Locks, drawer size and separations within the drawer to be coordinated with user.
h) Lab countertops & bench top materials should be selected to withstand the chemicals or other various applications within the lab and be able to be easily cleaned. Acid resistant P-lam/ black with plywood backing can be used for corrosive applications. A more resistive countertop will be required when it is subjected to both a corrosive environment and high temperatures or thermal shocks that may result from laboratory operations. Designer shall consult users on countertop usage and specific user requirements.

2. Laboratory Ventilation

2.1 General

a) Air exchange rates should be based upon the type of work being done within these areas.
b) Laboratory ventilation exhaust fans shall be spark-proof and constructed of materials or coated with corrosion resistant materials for the chemicals being transported. V-belt drives shall be conductive.
c) The discharge of hoods to the atmosphere shall be engineered in a manner that prevents re-entrainment of the exhaust stream back into the building or surrounding buildings. Under no circumstances shall a lab discharge be less than 10 feet above the surface of the roof.

2.2 Fume hoods

Note: Refer to York University Standard on Fume hoods for specific requirements.

a) All new laboratory fume hoods shall conform to the ***CSA Standard Z316.5-04 (Reaffirmed 2009)*** Fume Hoods and Associated Exhaust Systems and ***ANSI/ASHRAE 110-1995.***
b) In cases of existing fume hoods undergoing upgrades or renovations, every effort shall be made to meet the requirements of ***CSA Standard Z316.5-04***.
c) All fume hoods shall be equipped with an audible and visual alarm for indicating that the face velocity has fallen below the recommended set point.
d) Fume hoods shall not be installed near doorways
e) Fume hood exhaust installations and modifications of the system must be certified by the Provincial Ministry of the Environment (MOE).

Any inquiries about MOE certification (obtaining a Certificate of Approval) should be directed to Engineering Services office, CSBO (ext. 55147).

2.3 Biological Safety Cabinets

a) All Class I and Class II biological safety cabinet installation and testing must conform to the National Sanitation Foundation NSF/ANSI 49-2004a: Class II (Laminar Flow) Biosafety Cabinetry standard.
b) Biosafety cabinets should be certified by the supplier at the time of installation. They also need to be certified whenever they are moved as well as annually.

2.4 Canopy Hoods

a) Canopy hoods i.e., overhead hoods are only intended to vent non-toxic materials such as heat, steam or odours from large or bulky apparatus e.g. ovens, steam bath, autoclaves and not designed for a personal work station.
b) Where work involves release of volatile toxic materials, a chemical fume hood shall be used.

3. Emergency Eye Wash and Shower Units

a) The emergency eye washes and showers be clearly identified and easily accessible, located within the immediate vicinity of exposed workers and supplied with tepid (warm water). These emergency units should be reached within 10seconds walking distance (approx. 50feet).
b) For details on the design, installation and maintenance of the equipment refer to YU Eye wash and emergency shower equipment standard.
c) ***The American National Standards Institute (ANSI) Z-358.1*** is the applicable standard for eyewash and emergency shower.

4. Laboratory Storage

4.1. Shelving and edge guards

Open laboratory shelves used for storage of chemicals or any other hazardous materials shall be equipped with edge guards having dimensions height. 12.7 mm to 19 mm (½ to ¾ inches)

4.2. Flammable liquid storage

a) Refer to ***Ontario Fire Code*** for details on these requirements.
b) ***UL/NFPA*** approved flammable liquid storage cabinets are required for flammable and combustible liquid storage.
c) Grounding must be provided where drums containing flammable materials are stored and if a dispensing station is needed.
d) Secondary containment must be provided to prevent any potential spills.

4.3. Corrosive liquid storage

Corrosion resistant-storage cabinets are required. Acids and bases should be stored separately.

4.4 Compressed gases

a) Compressed gas cylinders must be firmly attached to a secure structure by a non-combustible material such as metal chain. Nylon straps will burn in a fire and are thus not recommended.
b) Cylinder central storage areas should be built according to the applicable codes (Building, Fire Code etc.) and it should provide separate storage compartments for different type of hazardous gases e.g flammable, non-flammable, toxic etc.
c) Refer to YU Compressed gas cylinder safety program for details: http://www.yorku.ca/dohs/programs.html

5. Radiation laboratories

Nuclear substance laboratories where unsealed substances are used must conform to the requirements established by the Canadian Nuclear Safety Commission (CNSC).

5.1. CNSC Regulatory Document GD-52 (Design Guide for Basic and Intermediate Level Radioisotope Laboratories)

a) The CNSC Regulatory Document (GD-52): Design Guide for Nuclear Substance Laboratories and Nuclear Medicine Rooms (http://www.nuclearsafety.gc.ca/eng/acts-and-regulations/guidancedocuments/published/html/gd52/index.cfm) provides design requirements for a nuclear substance laboratory where unsealed substances are used.
b) A completed Design Assessment Form included in this document must be submitted to the CNSC by the Radiation Safety Officer for any new construction or major renovation (e.g., demolishing walls, changes to existing shielding or installing new fumehoods etc.).
c) The Design Assessment Form includes a checklist on finishing and fixtures, plumbing, storage, security, ventilation, shielding, and dose estimation for nuclear substance laboratories. For alternate design features, a justification for the variance must be sent to the CNSC.

Contact the institutional Radiation Safety Officer for advice.

6. Laboratories handling biological agents

For design requirements of the labs handling biological agents, refer to (1) ***Public Health Agency of Canada's Laboratory Biosafety Guidelines and/or(2) Canadian Food Inspection Agency's Containment Standards for Veterinary Facilities.***
A commissioning plan should be developed and documented to facilitate the construction in order to ensure that the finished containment zone, equipment, and containment systems, are built, installed, and will operate in accordance with the design intent and specifications. The plan should be developed early in the design stages and should define the commissioning process (e.g. scope, standards, roles and responsibilities, testing sequence, and deliverables). The

commissioning plan and process should be undertaken by the containment zone personnel and design engineers.

7. Lasers

a) Class 4 lasers need a lighted sign outside the laboratory.
b) Windows need to be covered when using Class 4 and 3b lasers and appropriate shielding is required for the beam.
c) Refer to YU Laser Safety Program for details on additional requirements: http://www.yorku.ca/dohs/prog-laser.html

8. Specialized Applications

8.1. Coldrooms

a) Coldrooms intended for human occupancy must meet standard requirements for fresh air supply rates.
b) Interior surfaces of cold rooms must be of non-porous material for ease of surface decontamination

8.2. Hazardous waste rooms

a) Hazardous waste rooms are areas for holding hazardous wastes to be collected by the Faculty/area to be then disposed properly.
b) Requirements for such rooms will vary according to the nature of the waste being stored and any activity taken place in the room. If oxidizing, flammable, volatile chemical waste is stored in the room, the room should have proper ventilation and a roof designed to handle an explosion.
c) An alarm indicating the failure of the ventilation system should be installed.
d) A loading dock is needed for access to drop of hazardous waste (e.g. chemicals) and pick up waste.