

LABORATORY EQUIPMENT STANDARDS

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PART 1 – GENERAL INFORMATION

1.1 SUMMARY

- A. No content.

1.2 REFERENCES

- A. No content.

1.3 DESIGN REQUIREMENTS

- A. Eye Wash and Safety Shower

Unless otherwise specified or exempt by the Director of the Department of Environmental Health and Safety, each new and renovated Laboratory, room, area or facility in which chemicals, or biological materials are used or stored shall be equipped with the following:

Eye wash and safety shower:

1. Eye wash

- A plumbed emergency eyewash meeting the most recent edition of ANSI Z358.1 and Appendices. Hand held single or double stream hoses are not a substitute for an ANSI approved hard-plumbed eye wash. These units may be used to supplement the approved showers and eye washes.
- The unit must be supplied with tepid water only.
- Locate the unit within a 10 second travel distance of the hazard work area and the path leading to the unit free of obstructions.
- A unit is required in the physical space if corrosive materials are used.
- Basin type units must be plumbed to a drain to meet the testing requirements of ANSI Z358.1.

2. Safety Shower

- A plumbed emergency shower meeting the most recent edition of Z358.1 and Appendices.
- The unit must be supplied with tepid water only.
- Locate the units within a 10 second travel distance of the hazard work area and the path leading to the unit free of obstructions.
- A unit is required in the physical space if corrosive materials are used.
- Install a floor drain in the area to collect the water and to facilitate the testing requirements of ANSI Z358.1.

B. Laboratory Exhaust Ventilation

The general exhaust ventilation for all spaces where hazardous materials are used or stored shall be designed for between 10 and 12 air changes per hour, unless prior approval is granted by DEHS. Local exhaust fans and the general laboratory exhaust must meet the most recent edition of ANSI Z9.5 and Appendices and the most recent edition of NFPA 45.

1. Laboratory Chemical Fume Hoods

- Must meet the most recent edition of ANSI Z9.5 and Appendices and NFPA 45. Units must meet the performance requirements outlined in the most recent addition of ANSI/ASHRAE 110.
- Fume hoods shall not be the sole means of room air exhaust.
- Unless otherwise noted in bid document, laboratories shall be designed with a total of 36" of linear width fume hood space for each user.
- Fume hoods shall be constructed of a non-combustible, non-porous material selected to resist corrosion and for the service intended.
- Special hood types (per chloric acid, radioactive, biological) must receive prior DEHS approval.
- An audible/visual alarm and flow measuring device is required to indicate low and/or high face velocities. It must have a digital display of the actual face velocity.
- The fume hood must be designed for a face velocity of 100 feet per minute at 50% face opening.
- Units with both horizontal and vertical sashes are preferred.

2. Fume Hood Exhaust Fans

- a. Must be located outside of the building housing the lab, or in a separate room that is maintained at a negative pressure to the rest of the building and provides direct access to the outside for discharge ducts.

3. Exhaust Trunks, Canopy Hoods, or other Local Exhaust Ventilation Units

- a. Must meet the design criteria outlined in the latest version of the ACGIH's Industrial Ventilation Manual. These units will be required if there is a specific need based on the equipment and/or processes planned for the laboratory space.
- b. Autoclave rooms in addition to having a canopy hood or other suitable means of local exhaust, shall have a minimum of 10 air changes per hour.

4. Ventilated Gas Cylinder Cabinets

- a. Will be designed to meet the criteria outlined in the latest version of the ACGIH's Industrial Ventilation Manual and the applicable NFPA codes. Gas cylinder cabinets are required if the following gases are used:
 - o Hydrogen
 - o Carbon Monoxide
 - o Silane
 - o Hydride Gases
 - o Any Highly Toxic Gases (NFPA Health Hazard Rating of 3 or 4)
 - o Chlorine
 - o Corrosive Gases
 - o Reactive Gases
 - o Any gas with a NFPA Health Hazard Rating of 2 with no physiological warning properties.
- b. Gas cabinets shall be equipped with an approved automatic sprinkler when storing flammable or toxic compressed gases (IFC 2012)
- c. Cabinets will be selected based on the properties and hazards of the gases to be stored therein. They must be approved by EHS prior to purchase, and must be certified prior to use.

5. Gas Detection Systems

Laboratories with gas cylinders that are flammable, toxic, or pose an asphyxiation hazard must have a gas detection system. The gas detection system must be approved by EHS.

C. Biosafety Cabinets

- 1. Are required if work involving infectious materials will take place in the lab, and must be approved by EHS.
- 2. All biological safety cabinets must be NSF listed, UL approved, and installed in accordance with the manufacturer's requirements.
- 3. Biological safety cabinets must be located away from means of egress and other high traffic areas.
- 4. A biosafety cabinet shall not be installed directly under air supply inlets.
- 5. Other biological containment devices, if incorporated to address the hazards, must be approved by EHS.
- 6. Cabinets will be selected based on the properties and hazards of the biological and chemicals to be used therein. They must be approved by EHS prior to purchase, and must be certified by an outside contractor with the appropriate credentials prior to use.
- 7. When Class II Type A biological safety cabinets are ducted, the duct must be canopy style and have an audible and visible exhaust alarm.

D. Autoclaves

1. The chamber shall be designed to meet the requirements and so be stamped by ASME. This will ensure that the requirements of the ASME Boiler and Pressure Vessel Code are met.
2. The manual control must be located in an easily accessible and safe location for usage, not behind the unit or in an area that is hard to get at. This feature is critical in emergency situations because it allows the complete operation of a cycle with no electrical power. It should also allow manual exhausting of the sterilizer chamber during a malfunction that would otherwise trap a load in the chamber.
3. The autoclave door should be designed with several independent mechanical and control features that provide for safety.
4. A control lock-out switch in the door that prevents starting a cycle if the door is not closed and locked.
5. Mechanical steam pressure lock - chamber pressure should "activate" a mechanism engaging the lock mechanism. This will prevent an operator from opening a door if pressure exists in the chamber.
6. Visual chamber gauge that easily identifies pressure in the chamber must be accessible to the operator. This gauge is a back-up to the control read out and will operate with no electrical power to the unit.

E. Facility Considerations

1. The floor under autoclave shall be monolithic, seamless or heat-sealed, coved and water-tight
2. Easy access for maintenance and repair
3. Sufficient space for waste collection and storage
4. Insulate exposed pipes
5. A corrosion-resistant basin is provided to prevent leakage
6. A stainless steel canopy hood is provided over the exit door of the autoclave to capture heat and steam
7. An emergency shut-off should be located within the reach of the operator and between the operator and the room exit
8. Autoclave rooms should have a minimum of 10 air changes per hour.

9. All owners, users and/or contractors, who are responsible for the installation of boilers or pressure vessels in this State, shall obtain a certificate of inspection from the Boiler Safety Program prior to the operation of the boiler or pressure vessel. Notwithstanding this provision, any newly installed boiler or pressure vessel may be operated for testing necessary for issuance of a certificate of inspection.

Source: <http://delcode.delaware.gov/title7/c074b/index.shtml>

F. Chemical Storage Cabinets:

1. Sufficient number of cabinets shall be installed to accommodate the anticipated quantity and type.
2. If caustic and acidic liquids are stored, separate corrosive cabinets are required.

G. Corrosive storage Cabinets

1. Should be manufactured in accordance with FM approval or UL listings.
2. Are recommended, but not required to be ventilated through the laboratory exhaust system.
3. Shall have shelving constructed to prevent spillage of contents with tight-fitting joints, welded or riveted liquid-tight bottoms, door sills of at least two inches, and lockable cabinet doors that are self-closing and self-latching.
4. Corrosive materials should not be stored in metal cabinets unless the materials of construction are specifically treated to be corrosion resistant.

H. Flammable Storage Cabinets

1. Are manufactured in accordance with FM approval or UL Listings.
2. Flammable storage cabinets will not be ventilated through the laboratory exhaust system unless:
 - Specific circumstances, such as malodorous chemical, require venting
 - They are vented by a separate dedicated system.
 - Prior written approval must be given by DEHS.
 - The design must conform to current NFPA and local code requirements.
3. Shall have shelving constructed to prevent spillage of contents with tight-fitting joints, welded or riveted liquid-tight bottoms, door sills of at least two inches, and lockable cabinet doors that are self-closing and self-latching.

I. Miscellaneous Requirements

1. Lab hazard sign holder located in the corridor at all entrances to the lab area.
2. Access to a corridor installed emergency phone with direct dial to Public Safety within 10 seconds or 100 foot travel distance of the laboratory.

3. Ground Fault Circuit Interrupters shall be installed in laboratory settings where electric outlets are within 6 feet of water sources.
4. An illuminated laser warning sign may be required if a Class 4 laser will be operated in the room. The sign must be posted at the entrance of the facility and must be capable of being interlocked to the laser power or to the shutter that allows the laser beam to exit the laser unit. Consult with Environmental Health and Safety prior to purchase.
5. Laboratories with operations that may require the use of lab coats must have an appropriate storage area for the lab coats.
6. All faucets will have backflow preventers and/or vacuum breaks to prevent contamination of the potable water supply.

J. Second Means of Egress

A second way out of the laboratory is required if any of the following condition(s) exist (as required by NFPA 45). The second means of egress must open out, away from the laboratory interior and cannot exit into a more hazardous condition.

1. The fume hood is located adjacent (within 10 ft.) of the primary means of exit access.
2. A laboratory work area contains an explosion hazard located so that an incident would block escape from or access to the laboratory work area.
3. A laboratory work area within a Class A laboratory unit exceeds 46.5 m² (500 ft²)
4. A laboratory work area within a Class B, Class C, or Class D laboratory unit exceeds 93 m² (1000 ft²)
5. A compressed gas cylinder larger than lecture bottle size is located such that it could prevent safe egress in the event of an accidental release of cylinder contents.
6. A cryogenic container is located such that it could prevent safe egress in the event of accidental release of container contents.
7. A fume hood is located between a user and an exit.
8. A gas cylinder storage area or cabinet is located between a user and an exit.
9. Any gas cylinder with a health, fire or reactivity hazard rating of 3 or 4 is used in the space. Hydrogen is a common example.
10. The laboratory is a high hazard laboratory or uses large quantities of hazardous materials.

K. Animal Facilities

1. Laboratory animal facilities shall be designed and constructed according to the minimum standards specified in the Guide for the Care and Use of Laboratory Animals to assure AAALAC accreditation.
2. Agricultural animal facilities shall be designed and constructed according to the minimum standards specified in the Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching.

- L. High hazard laboratories and areas that use specialized equipment (i.e. magnets) or perform specialized operations will require additional measures that may not addressed in this document. Contact EHS for the detailed specifications

*A hazardous chemical shall mean any element, chemical compound or mixture of elements and/or compounds which is a physical hazard as defined by OSHA Standard in 29 CFR Section 1910.1200(c) or a hazardous substance as defined by the OSHA Standard in 29 CFR Section 1910.1200(d) (3).

M. Approved Manufacturers

1. Eyewash and Safety Showers
Manufacturer: Speakman (Eyewash & Safety Shower)
Models: Wall Mounted Eyewash (floor drain required) – SE-490, SE-495
 - o Counter Mounted Eyewash, SE-572, SEF-1800
 - o Free Standing Eyewash/Shower Combination (floor drain required) - SE-690, SE-695
 - o Free Standing Shower, SE-253
 - o Horizontal Shower, SE-227
2. Fume Hoods
Manufacturers: Mott, Fisher Hamilton, Kewaunee
3. Flammable and Corrosive Storage Cabinets
Manufacturer: Kewaunee, Fisher Hamilton, Justrite, Securall
4. Fume Hood Audio/Visual Alarms
Manufactures:
Phoenix Controls X30 Series Fume Hood Monitor
FHM631 (with the digital display of the actual face velocity)
TSI FHM10 Fume Hood Monitor (new product, replaces the EverWatch)
TEL-UK AFA 1000/1 and AFA1000/2
Alnor (owned by TSI) Airguard Lab Hood Monitor
335-D w/ the digital display of the face velocity

End of Section