Note that all items highlighted in blue have been migrated over to Division 23 and will be removed from Division 13 in the next Building Standards annual update.

13 00 10 LABORATORIES

1. Intent: Provide laboratory facilities that meet all code requirements, industry safety standards, and research best practices. University laboratories shall provide a safe and productive environment for laboratory personnel to conduct their work. Laboratories shall be designed to provide general uniformity compared to other University of Minnesota laboratory facilities of similar age and research use.

2. References and Governing Regulations

"American National Standard for Emergency Eyewash and Shower Equipment," ANSI Z358.1
"Laboratory Ventilation," ANSI/AIHA Standard Z9.5
American National Standards Institute (ANSI)

"Biosafety in Microbiological and Biomedical Laboratories", Centers for Disease Control and Prevention and National Institutes of Health, US Government Printing Office

"Guide for the Care and Use of Laboratory Animals" and "Occupational health and Safety in the Care and Use of Research Animals," National Research Council, National Academy press, Washington, D.C.

"Guidelines for Construction and Equipment of Hospital and Medical Facilities,"
The American Institute of Architects Committee on Architecture for Health with assistance from the U.S. Department of Health and Human Services
American Institutes of Architects Press

"Industrial Ventilation: A Manual of Recommended Practice"
American Conference of Governmental Industrial Hygienists

National Fire Codes
Especially standards 45, 99, 101
National Fire Protection Association (NFPA)

OSHA 29 CFR 1910.1450 "Occupational Exposure to Hazardous Chemicals in Laboratories"
OSHA 29 CFR 1910.151(c) "Medical and First Aid"

3. Design Review Process
3.1. The contract documents shall contain an equipment and furnishings schedule that includes necessary product identification, function descriptions, handling, mechanical and electrical equipment/accessories, hardware indications, installation accessories and finishes.

3.2. File a Hazardous Materials Inventory Statement (HMIS) and a description of laboratory activities with HSRM and the Building Code Division (BCD) when a construction project is proposed. This information is required for each control area. The HMIS is used to determine the hazard classification of a laboratory and fire separation areas within the building. If it is not feasible to prepare this information, or if it is notfiled, the occupancy shall be classified as hazardous under the International Building Code. HSRM may assist the A/E with the collection and evaluation of the hazard information.

3.3. Laboratories Occupancy classifications shall comply with National Fire Protection Association (NFPA) 101, "Life Safety Code."
Laboratories shall also be designed with reference to one of the following occupancy classifications:
A. Business
B. Healthcare
C. Industrial

3.4. The A/E or Project Manager shall meet with the user to determine preliminary program requirements.

3.5. The A/E or Project Manager shall review the preliminary program requirements with HSRM, BCD, and Disability Services.

3.6. The A/E shall complete the programming design phase.

3.7. The users, HSRM, BCD, and the Project Manager shall review and approve the program design.

3.8. The A/E shall contact and work directly with HSRM to determine and arrange for the implementation of all design, construction, commissioning and documentation requirements associated with Biosafety Level 3 (BSL3) facilities.

3.9. The A/E shall review laboratory ventilation systems with the HSRM, BCD, and Facilities Management during the program phase of the design process.

3.10. A floor plan showing control areas, H occupancies, BSL3 facilities and laboratory compartments must be placed near the fire department entrance to a building.

4. General Design
4.1. Laboratories must be built as compartments to improve occupant safety and minimize disruptions to business activities and property loss that may be caused by a fire or chemical releases. This compartmentation is in addition to control area separations required by the International Building Code.
4.2. Walls for enclosed laboratory spaces shall be constructed floor to deck. All penetrations of the walls shall be sealed to restrict air movement across the wall and to

assist in maintaining the required room-to-room pressure differentials.

4.3. Aisles serving a single work area must be a minimum of 36 inches wide. Double aisles must be a minimum of 60 inches wide. Avoid aisles longer than 20 feet. Arrange furniture for easy access to an exit from any point in the laboratory.

4.4. Provide adequate storage volume for research chemicals and waste. Chemical resistant storage trays shall be furnished to contain a spill of free liquid in the storage unit. Storage cabinets should have integral welded shelf hangers that interlock with shelf; shelf support clips should be avoided.in the storage unit. Refer to Division 12, Section 123553 - Laboratory Casework.

4.5. Provide sufficient storage space to protect new and waste chemicals. Without adequate storage space, containers of waste chemicals are often boxed and stacked on the floor where they might be broken and cause injury.

5. Electrical

5.1. Provide ground fault circuit interrupters (GFIs) on electrical outlets within 6 feet of all sinks, aquatic vivariums, and in locations where surfaces may be cleaned with sprayed water.
5.2. Identify emergency power outlets in accordance with Division 26, Section 262726-Wiring Devices.

5.3. Provide an outlet for every 3 feet of bench top.

6. Plumbing

6.1. **PROHIBITED:** Floor drains shall not be located in laboratories, except in certain cases such as in large animal housing areas, or utility areas that require discharge of water from equipment.
6.2. Faucets, to which a hose or similar device may be attached, shall be provided with an approved vacuum breaker. Alternately, a special laboratory water supply equipped with an RPZ back flow device to separate it from the potable water may be provided. If a laboratory water system is provided, all connected outlets shall be labeled “Not Potable.”

6.3. A safety shower and eyewash shall be provided in each lab area equipped with a fume hood. An eyewash shall be provided in other laboratories using hazardous chemicals (including chemical disinfectants) or radiological materials. An eyewash shall be provided in a readily accessible location where biological agents requiring BSL1, BSL2 or BSL3 containment are stored and used. Refer to 13 00 12 - Emergency Eyewash and Safety ShowerInstallation.

6.4. Reagent grade 3 water is feasible to maintain and is usually adequate for central building distribution. Reagent grade 3 water, as specified by the College of American Pathologists or the National Committee for Clinical Laboratory Standards, is resistive at 25 degrees C of 0.1

megohms/centimeter and a pH between 5 and 8. If needed, higher-grade water can be generated at the point of use. Refer to Division 15, Section 15400 -Plumbing, item 3. High Purity Water Systems for more information.

7. Gases

7.1. Provide a single shut-off valve for each laboratory in accessible locations for central supply of flammable, combustible, or oxidizing gases. Valves shall be outside of the areas in which the gases are used. These shut-off valves are in addition to those at the points of supply and use. They may be located adjacent to the corridor exit from the lab or, if security is not a problem, in the corridor.

7.2. Storage and supply systems for compressed and liquefied gases shall comply with requirements of NFPA and ANSI. Consult the following standards:
A. NFPA 50, Standard for Bulk Oxygen Systems at Consumer Sites
B. NFPA 50A, Standard for Gaseous Hydrogen Systems at Consumer Sites
C. NFPA 50B, Liquefied Hydrogen Systems at Consumer Sites
D. NFPA 51, Design and Installation of Oxygen-Fuel Gas Systems for Cutting and Welding
E. NFPA 54, National Fuel Gas Code
F. NFPA 55, Compressed Gases and Cryogenic Fluids
G. NFPA 58, Standard for the Storage and Handling of Liquefied Petroleum Gases
H. NFPA 99, Standard for Health Care Facilities
Chapter 3 - Use of Inhalation Anesthetics (flammable and non-flammable)
Chapter 4 - Use of Inhalation Anesthetics in Ambulatory Care Facilities
Chapter 5 - Respiratory Therapy

7.3. Systems for other gases shall comply with the manufacturer's recommendations. "The Handbook of Compressed Gases" by the Compressed Gas Association and the "Matheson Gas Data Book" by Matheson Gas Products may be consulted as a reference standard.

8. Utility Control Labeling

8.1. Controls for air, gas and other utilities shall be color-coded and labeled in accordance with the Scientific Equipment and Furniture Association (SEFA) 7 as follows:
Number Service Color Code Color of Letter
1 Cold Water Dark Green CW
2 Chilled Water Brown CH
3 Hot Water Red HW
4 Steam Black STM
5 Air Orange AIR
6 Gas Dark Blue GAS or NAT GAS
7 Vacuum Yellow VAC
8 Distilled Water White DW
9. Deionized Water White DI
10. Reverse osmosis Water White RO

11. Oxygen Light Green OXY or O2
12 Hydrogen Pink H or H2
13 Nitrogen Gray or Brown N or N2 or NIT
14 All Other Rare Gases Light Blue Chemical Symbol

9. Fire Extinguishers

9.1. Provide fire extinguishers based on the area protected and hazard class. Refer to NFPA 10. Provide an UL-listed, 5-pound multipurpose dry chemical fire extinguisher with at least a 1A20BC rating mounted near an exit for each laboratory.

10. Room Ventilation

10.1. **PROHIBITED:** Recirculation of exhaust air from laboratories with ASHRAE Class 3 and 4 air. Per Minnesota Rule 5205.0110, Subpart 4, air from an exhaust system handling materials listed in 29 CFR Subpart Z shall not be recirculated without written permission from the MNOSHA.

10.2. Laboratories using hazardous chemicals shall be under at least 0.01 inches WG (2 Pa.) negative pressure with respect to nonhazardous adjacent areas. In the case of adjoining laboratories, airflow direction shall be from laboratories of lower hazard to areas of higher hazard (e.g., prep or storage rooms into the main chemical usage laboratory. However, negative pressure must not exceed 0.05inches WG(10 Pa.) to avoid outside air infiltration.

10.3. Combine filters and air cleaners to achieve MERV 13-equivalent or better levels of performance for air cleaning.

10.4. Local exhaust ventilation devices shall be designed with reference to the latest edition of "Industrial Ventilation: A Manual of Recommended Practice by the American Conference of Government Industrial Hygienists" and ANSI/ASSP Z9.2.

10.5. Noise from the laboratory ventilation systems shall not exceed an average of NC 45 throughout the laboratory and the space immediately near the fume hood must not exceed NC 55..

10.6. Supply diffusers must be selected and placed to minimize both cross-drafts across the face of fume hoods, biosafety cabinets, and other local exhaust devices and to minimize short-circuiting of supply air to an exhaust vent of device.

10.7. When construction, shutdown, or modification of ventilation systems occurs, laboratories shall be rechecked for appropriate pressure differential and rebalanced as necessary.

10.8. Use of occupancy sensors that modify laboratory ventilation shall go through a hazard assessment process with HSRM and be capable of override or modification in case research needs change.

11. Finishes (Fixtures, Floors, Casework)

11.1. To facilitate long-term maintenance and reuse of casework, metal casework shall be provided. In areas performing biological research casework is frequently washed with bleach solution or other disinfectants. The following items are preferred in laboratories and may be required when appropriate:

A. Metal laboratory furniture with stainless or 1-inch epoxy resin bench top
B. Wall cabinets with a continuous enclosed front plane to the ceiling
C. Bleach solution-resistant waste lines
D. A glassware cleaning sink at least 12 inches deep. It is desirable to not install a lower shelf in sink cabinets because they are often damaged by water.

11.2. Laboratory floors, walls and doors require the following:
A. Floor finishes must be NFPA class I rated to minimize flame spread.
B. Floors shall be covered with a smooth, non-porous material that is resistant to a wide range of chemicals. Floors shall be sealed watertight.
C. Walls and doors shall be constructed or painted with a smooth, non-absorbent, washable material.
D. Interior finishes must be NFPA class A to minimize combustible load.
E. Doors shall be self-closing and lockable.
F. Lighting fixtures shall be flush-mounted with the ceiling and have removable, easily cleaned diffusers.

11.9. When biohazardous agents, human body fluids and general microbiology products are generated, an autoclave shall be designated to handle sterilization. It shall be provided witha dedicated exhaust to control odors. The exhaust system shall include a canopy over the door to the autoclave.

13 00 11 FUME HOODS

1. Intent: Provide fume hoods that safely capture hazardous, flammable, corrosive or toxic chemicals and that allow for changes in laboratory function and fume hood use.

2. Governing Regulations

2.1. See item #2 in section 13 00 10.

2.2. University of Minnesota Standards and Procedures for Design must be reviewed for specifications on material and equipment. These are general standards for typical research uses. In special circumstances, different standards may apply.

3. General Features

3.1. **PROHIBITED:** Installing heated drying cabinets under fume hoods.

3.2 **PROHIBITED:** Installing filtering (recirculating) fume hoods.

3.3. **PROHIBITED:** Contact volume speed fans serving fume hoods.

3.4. Fume hoods in research laboratories much comply with ANSI/AIHA Z9.5 Class A performance standards, and a face velocity shall be chosen by the designer, not less than 80 fpm, and not more than 150 fpm, that considers hazard levels, space airflow properties, and any other considerations deemed relevant to the design. The designer will submit a narrative prior to schematic design describing how the face velocity was chosen.

3.5. Locate hoods distal corners of a laboratory and away from high traffic areas and doorways to avoid high turbulence from people walking past the hood and to prevent blocking an exit if there is a chemical spill or fire near the hood.

3.6. As a general rule, provide 2 lineal feet of chemical storage space for each lineal foot of fume hood width. Refer to Division 12, Section 123553 - Laboratory Casework.

3.7. On hoods wider than 4 feet, the horizontal safety shield must be in place. Face velocity shall be tested according to methods described within ANSI/ASHRAE 110. No individual reading shall exceed 20% of the average velocity, and cross-drafts shall not exceed 30% of the face velocity.

3.8. Fume hoods shall run continuously to minimize potential hazards when the fume hoods are off.

4. Supply Air

4.1. **PROHIBITED:** Auxiliary air supply fume hoods.

4.2. **PROHIBITED:** Designs that may cause cross drafts and turbulent air in rooms.

4.3. To ventilate efficiently and minimize turbulence, diffuse supply air from behind the operator. Consider technology that diffuses air in a radial manner with high volume and low velocity, or other pattern-control technology.

4.4. Supply air at a rate that tracks laboratory ventilation rates to maintain pressure differential.

4.5. To ventilate efficiently and minimize turbulence, diffuse supply air from behind the operator. Consider technology that diffuses air in a radial manner with high volume and low velocity, or other pattern-control technology.

5. Exhaust System

5.1. **PROHIBITED:** Fire or smoke dampers in any fume exhaust duct.

5.2.

5.3. VAV hoods shall be equipped with emergency overrides on the unit exterior that permit full design flow even when the sash is closed.

5.4. High duct velocity results in high noise levels, excessive leakage and high-power consumption. Therefore, air velocity on the suction of the fan shall be a minimum of 1,000 feet per minute (fpm) and shall not exceed 2,000 fpm under any circumstances.

5.5. General-purpose fume hood ductwork shall be 304 stainless steel. The fan and housing shall be corrosion resistant. Special purpose fume hoods may be constructed of other materials onlyafter thorough review with HSRM and the user.

5.6. If more than one hood is connected to an exhaust duct, a balanced drop without a damper must be engineered or blast gate dampers must be provided. Each fume hood shall have an air valve serving it.

5.7. Provide an exhaust system for laboratory equipment such as flammable liquid storage cabinets, biological safety cabinets, gas cabinets, HPLC, welding, sawing, grinding, additive manufacturing, and analytical equipment, as required.

6. Fans and Discharge

6.1. **PROHIBITED:** Square to round fabric connectors.

6.2. **PROHIBITED:** Radial-blade, paddle-wheel type centrifugal fans.

6.3. **PROHIBITED:** Installing positively pressured ductwork containing hazardous ASHRAE Class 4 laboratory air in building interior.

6.4.

6.5. If flammable gas, vapor, or combustible dust is anticipated to be present in exhaust in concentrations above 20% of the lower flammable limit, exhaust fans must be constructed as recommended by Air Movement and Control Association International (AMCA) 99-0401, “Classification for Spark Resistant Construction.”

6.6. Stack-design and discharge velocity shall distribute contaminants outside the eddy current envelope of the building. On structures with roof areas at more than one level, discharge ducts within 30 feet of a higher level shall terminate at a point at least 10 feet above the elevation of the higher level and any air intakes. A wind study may be used to refine placement of exhaust stacks.

6.7. Cluster discharge ductwork when designing exhaust ductwork in close proximity in new and existing buildings.

6.8. Maintain the maximum distance from fresh air intakes on the building and on adjacent buildings. Maintain at least 100 feet between fume hood exhausts and fresh air intakes.

In the presence of positively pressurized ductwork containing hazardous materials, ventilate the equipment room (1 CFM/SF) where fume hood exhaust fans are located.

7. Fume Hood Construction

7.1. Non-combustible, corrosion-resistant construction is required.

7.2. Use an airfoil design to minimize air turbulence entering the fume hood.

7.3. Provide a vertical sliding safety glass sash that is balanced and counterweighted.

7.4. The vertical sliding safety glass sash shall have a positive steel mechanical latch 18 inches above the work surface. The latch prevents the operator from opening the sash above 18 inches without intervention. The operator shall be able to handle the latch with one hand and close it from any position.

7.5. Provide an 11-inch wide to 12-inch wide horizontal sliding safety-glass shield on hoods that are 4 feet and longer. The shield shall be suspended on bearings or slide in an easily cleaned channel.

7.6. A removable safety shield is permitted on hoods that are 4 feet or shorter. When a removable shield is provided, do not consider the area of the shield when calculating the exhaust volume of the fume hood.

7.7. Locate electrical outlets on the exterior of the fume hood.

7.8. Locate utility controls for gas, water and vacuum on the exterior of the hood with utility outlets mounted on the interior sidewall. Label and color-code controls.

7.9. Provide a liquid-tight work surface built to contain at least 3/8-inches of liquid.

7.10. Mount cup sinks on a raised lip to partly contain a spill before the liquid flows into the sink. The cup sinks shall be between ¼ and 3/8 of an inch lower than the surrounding raised margins of the work surface.

7.11. Provide an electronic airflow indicator with an audible alarm in a conspicuous location so that the user can see the status of the airflow that will indicate when flow is high or low by 20%.

7.12. Interior lighting shall be LED, vapor-sealed and covered with a safety glass lens. Lamps shall bereplaceable from the exterior of the hood. Illumination levels at the working surface shall be at least 80 foot-candles.

7.13. Mark fume hoods with the identifier of the exhaust fan that serves the unit.

7.14. Perchloric acid fume hoods shall be built in compliance with NFPA 45.

8. Radioisotope Fume Hoods - Additional Requirements:

8.1. Contact HSRM for construction requirements pertinent to the user's license.

8.2. The interior lining and baffles of the fume hood shall be smooth, polished, type 304 stainless steel. The need for seamless welded construction depends upon NRC license requirements. Usually, seamless welded construction is not required.

8.3. The work surface shall be capable of supporting up to 200 pounds per square foot of shielding material.

8.4. Work surface corners shall be smooth, seamless stainless steel with 1/2-inch radius.

8.5. An exhaust filter enclosure with a pre-filter and a HEPA and/or charcoal filter usually is not required for radioisotope hoods. If required, however, the enclosure must meet the followingspecifications:

8.5.1. **PROHIBITED:** Proprietary or custom-sized filters and pre-filters.

8.5.2. The filter enclosure must be airtight and constructed of stainless steel.

8.5.3. The filter enclosure shall be easily accessible from the outside of the hood. The filter enclosure shall provide bag-in/bag-out of filters, so the maintenance staff is not exposed to collected material.

8.5.4. Provide an indicator on hoods with a filter enclosure that is clearly visible and indicates when the pressure drops across the filter.

8.5.5. Use a standard-size pre-filter and charcoal and/or HEPA filter on the filter enclosure.

8.5.6. Radioisotope fume hoods in laboratories must comply with ANSI/AIHA Z9.5 Class A performance standards, and a face velocity shall be chosen by the designer that considers hazard levels, space airflow properties, filter loading, and any other considerations deemed relevant to the design. The designer will submit a narrative prior to schematic design describing how this face velocity was chosen.

8.5.7 Fume hoods provided with filter enclosures always shall be individually ducted.

13 00 12 BIOLOGICAL SAFETY CABINETS

1. **Intent:** Provide BSCs that protect personnel and the environment from biohazardous materials via laminar or uniform directional airflow using HEPA filtration when appropriate practices and procedures are followed.

2. **Governing Regulations**

   2.1. See item #2 in section 13 00 10.

   2.2. University of Minnesota Standards and Procedures for Design must be reviewed for specifications on material and equipment. These are general standards for typical research uses. In special circumstances, different standards may apply.

3. **General Features**

   3.1. PROHIBITED: Pressurized gas, including natural gas, must not be piped to BSC.

   3.2. Consult with BOHD during planning for assistance regarding selection and placement of BSCs.

   3.3. Supply air turbulence is a most significant factor affecting capture efficiency so supply air and location of BSCs in a room must be carefully considered.

   3.4. Locate BSCs in distal corners of a laboratory and away from doorways or high traffic areas to avoid high turbulence from people walking past the BSC and to prevent blocking an exit if there is a spill of biohazardous material or fire near the BSC. BSCs must not be located near fume hoods.

   3.5. BSCs must have a minimum of 6 inches of clearance on each side to facilitate certification and/or repair.

   3.6. Class II, Type A1 or A2 BSCs: recirculated air; shall not be hard ducted to the building exhaust air system, nor shall a thimble connection be used; can be used for work with nonvolatile toxic chemicals and radionuclides; consult with BOHD required.

   3.7. Class II, Type B1 or B2 BSCs: partially exhausted (B1) or fully exhausted (B2); can be used for work with nonvolatile toxic chemicals and radionuclides and small amounts of volatile toxic chemicals and radionuclides; consult with BOHD required.

   3.8. Minimal use of alcohol and other chemical disinfectants is permissible in all types of BSCs

3.9. The mechanical design for ducted BSCs must ensure proper air is provided for proper functioning. In addition, ducted BSCs must have a damper to allow the exhaust duct to be completely shut down for gaseous decontamination.

3.10. Ducted BSCs must have a damper to allow the exhaust duct to be completely shut down for gaseous decontamination.

3.11. BSCs shall comply with NSF/ANSI Standard 49 for Class II Biosafety Cabinetry.

3.12. Laminar flow clean air devices such as clean benches shall comply with Institute of Environmental Sciences (IES) Standard IES-RP-CC002.

3.13. **Comparison of Biosafety Cabinet Characteristics (From BMBL, 6th ed., 2020, pg. 388)**

BSC Class	Face Velocity	Airflow Pattern	Application: Nonvolatile Toxic Chemicals and Radionuclides	Application: Volatile Toxic Chemicals and Radionuclides
I	75	In at front through HEPA to the outside or into the room through HEPA	Yes	When exhausted outdoors [a, b]
II, A1	75	70% recirculated to the cabinet work area through HEPA; 30% balance can be exhausted through HEPA back into the room or to outside through a canopy unit	Yes (small amounts) [b]	Yes (small amounts) [a, b]
II, B1	100	30% recirculated, 70% exhausted. Exhaust cabinet air must pass through a dedicated, internal cabinet duct to the outside through a HEPA filter	Yes	Yes (small amounts) [a, b]
I, B2	100	No recirculation; total exhaust to the outside through a HEPA filter	Yes	Yes (small amounts) [a, b]
II, A2	100	Similar to II, A1, but has 100 lfm intake air velocity exhaust air can be ducted to the outside through a canopy unit	Yes	When exhausted outdoors (formally B3), (small amounts) [a, b]
II, C1	100	30% recirculated, 70% exhausted. Exhaust cabinet air must pass through a dedicated, internal cabinet duct to the outside through a blower and HEPA filter	Yes	Yes (small amounts) [a, b]

III	N/A	Supply air is HEPA-filtered. Exhaust air passes through two HEPA filters in series and is exhausted to the outside via a hard connection	Yes	Yes (small amounts) [a, b]

a. Installation requires a special duct to the outside, and may require an in-line charcoal filter, and/or a spark-proof (explosion-proof) motor and other electrical components in the cabinet. Discharge of a Class I or Class II, Type A2 cabinet into a room should not occur if volatile chemicals are used.

b. A risk assessment should be completed by laboratory and safety facility personnel to determine amounts to be used. In all cases, only the smallest amounts of the chemical(s) required for the work to be performed should be used in the BSC. In no instance should the chemical concentration approach the lower explosion limits of the compounds.

c. Class IIA1 cabinets built prior to 2010 were allowed to have potentially contaminated, positively pressurized plenums. After 2010, all class II cabinets must have potentially contaminated plenums under negative pressure or surrounded by negatively pressurized plenums.

4. Exhaust System

4.1. **PROHIBITED:** Modulating or controlling BSC exhaust volumes to balance air requirements for air conditioning or heating.

4.2. To ensure proper operations of BSC exhaust systems and mitigate risk of exposure due to fluctuations in building exhaust, systems shall be ducted in accordance with ANSI Z9.5 guidance and adhere to manufacturer requirements.

4.3. Ductwork shall be oval or round to ensure uniform airflow.

4.4. Provide an exhaust system for ducted BSCs, as required.

5. Fans and Discharge

5.1. Class 2, B2 BSCs are required for application involving volatile toxic chemicals and biohazardous materials.

5.2. Ducted, Type B cabinets must be direct-connected, preferably to a dedicated, independent exhaust system. Fans for laboratory exhaust systems must be located at the terminal end of the ductwork to avoid pressurizing the exhaust ducts.

5.3. The mechanical design and air balance testing of the laboratory exhaust system for Class II Type B BSCs must use Concurrent Balance Values (CBV) as published in the NSF/ANSI 49 Standard. This standard describes the requirements for the construction and function of a Class II BSC.

13 00 13 - EMERGENCY EYEWASH AND SAFETY SHOWER INSTALLATION

1. Intent: Provide an effective method for flushing harmful (toxic or corrosive) chemical or biological agents, or other foreign materials out of the eyes or off the body.

2. Governing Regulations: See item #1 in section 13 00 10 for governing regulation publications.

3. General Requirements

3.0 Supply sink mounted eyewashes.

3.1. Locate eyewashes and safety showers in areas where the eyes or body may be exposed to harmful chemicals or contamination with infectious agents. Refer to applicable material safety data sheets to determine whether materials are harmful. Laboratories, battery operations and cage washing areas are examples of areas where harmful chemicals may be used.

3.2. In laboratories where a fume hood is installed, provide an eyewash and safety shower. In BSL1 and BSL2 laboratories, an eyewash station must be readily available.

3.3. Locate eyewashes and safety showers so that the maximum distance from the hazard does not exceed 50 feet and so that theycan be reached within 10 seconds. Occupants must not pass through a doorway or weave through equipment to reach the eyewash and safety shower.

3.4. When provided to protect against exposure to a biological agent, locate the eyewash ina readily accessible location within 10 seconds of the work area. Be sure that the eyewash is located in an area under control of workers so that a door in the path of access cannot be blocked.

3.5. Locate eyewashes and safety showers in the normal path of egress. For example, in a laboratory, the eyewash and safety shower should be near a corridor door.

3.6. Tempered water shall be supplied to eyewashes and safety showers to between 60 degrees F and 95 degrees F. To minimize ongoing maintenance cost, consider designing tempered water systems on a loop that maximizes the number of fixtures served by a single tempering valve.

3.7. Use potable water to supply eyewashes and safety showers.

3.8. One handed operation of the eyewash is required. The valve shall remain activated until intentionally shut off. To provide consistency to building occupants, the activation device for the eyewash and safety shower must be uniform throughout the building.

4. Eyewash Performance

4.1. Eyewashes shall provide streams of water simultaneously released from two sides to clean foreign particles or liquids from both the eyes. The discharge pressure of the steam must be less than 25 psi. over the entire facial area.

4.2. Eyewashes shall have a flow rate of at least 0.4 gallons per minute.

4.3. The preferred activation method of the eyewash is a paddle with dimensions approximately 4 inches by 4 inches. The control shall require no more than 10 ounces of force for activation. The valve shall remain activated until intentionally shut off.

4.4. The maximum distance from the floor to the eyewash jets shall be 36 inches.

4.5. To facilitate weekly flow testing, drain eyewash fixtures directly into the sanitary sewer in accordance with the Minnesota Plumbing Code.

4.6. When eyewashes on flexible hoses are provided, a vacuum breaker is required to protect potable water.

5. Safety Shower Performance

5.1. Safety showers shall be deluge types with a continuous flow valve. The valve shall remain activated until intentionally shut off.

5.2. Safety showers may be installed in combination with an eyewash fixture. The supply lines and connections of combination units shall not create obstructions for persons using the laboratory.

5.3. Provide a head discharge of at least 20 gallons per minute for safety showers.

5.4. The distance from the floor to the shower shall be 82 inches to 96 inches.

5.5. Wall cord, ring and chain, or pull bar, located no higher than 48 inches from the floor may activate the shower. To prevent accidental discharge, locate the activating device so that it is not in the way of normal occupant activity.

5.6. Floor drains are not required under emergency showers.

13 00 14 – Laser Laboratories

1. Signage

1.1 Newly constructed or renovated laboratories designed to house Class 4 lasers or laser systems are to have a lighted “Laser in Use” (or equivalent wording) warning sign installed:

- 1.1.1 Preferably, to one side of the main entrance(s) to the lab, close proximity to the door handle, or,
- 1.1.2 Directly above the main entrance(s) to the laser lab.

1.2 The sign(s) will be actived:

- 1.2.1 By a manual switch, ideally located near the point of operation of the laser or laser system, or,

1.2.2 Automatically when the laser or laser system is activated through an interlock system.

2. Entryway Controls

2.1 Per the University Laboratory Safety Program, and ANSI Z136.1-2022 *Safe Use of Lasers*, Class 4 laser labs shall incorporate at least one of the following entryway controls:

2.1.1 Non-defeatable safety latches, entryway, or area interlocks

2.1.2 Defeatable safety latches, entryway, or area interlocks in the case that non-defeatable safety latches would limit the intended use of the laser system.

2.1.3 Procedural area or entry safety controls including adequate training of all personnel and doors, barriers, or curtains to block or attenuate laser radiation at the entryway.

2.2 Interlocks on entry door(s) wired to activate a laser shutter or reduce the laser output to a safe level (below the Maximum Permissible Exposure) upon opening of the door into the laser use area; those doors without a curtained entryway enclosure must be equipped with a non-defeatable (or defeatable) interlock system, while doors protected by curtained enclosure may, in addition, have either a non-defeatable or a defeatable interlock system (i.e., bypass switch allows trained individuals to temporarily bypass the interlock when entering or exiting). Should an interlock system not be possible it can be replaced by procedural controls such as training, signage, and barriers.

2.3 Curtains, composed of fabric sufficiently fire-resistant to prevent combustion when struck by the laser beam, at the primary entrance of the laser lab; arranged such that, when closed, it fully protects the doorway from stray beams that might otherwise exit the lab.

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