FACILITIES STANDARD

NAME : Hoods and Auxiliaries
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PURPOSE:

1. The general purpose of Facilities Standards is to provide the University an approved, documented criteria for construction, material stocking and replacement, consistent maintenance of facilities, code compliance, and provisions for uniformity and uniqueness of facilities standards.

2. All construction of University property, in reference to safety issues will be conducted in accordance with NFPA 241 safeguarding construction, alteration, and demolition operations, and the Standard Building Code, in Chapter 33, SAT work, demolition, and construction, to protect the health and safety of faculty, staff, patients, visitors, and students, as well as unrelated, non-project, UAB property.

3. Construction safety is the responsibility of the contractor for any project. Each responsibility, as stated in the contract documents, relate to all recognized rules, regulations and codes adapted by any agency having jurisdiction, and the guidelines established during the occupational standards and health act.

4. The purpose of this Facility Standard on Hoods and Auxiliaries is to establish a series of administrative actions that must be taken that are unique to any particular project under construction at the University.

GENERAL:

1. See **General Design and Construction Requirements for Laboratories** as prepared by the UAB Department of Occupational Health and Safety for the mandatory requirements for ALL laboratories, new and remodeled. These standards are part of the above standards and are reproduced only in those parts relating to the air and control requirements for such typical laboratories to assist the Mechanical Engineer.

VENTILATION:

1. Proper ventilation is one of the most critical components in laboratory safety. This is due to the wide variety of potentially hazardous materials used. Almost any

laboratory will contain materials that are flammable, combustible, corrosive, toxic, carcinogenic, and teratogenic. Even with the use of fume hoods, problems may occur.

2. It is not necessary for a spill or other accident to occur in a laboratory for problems to result. Virtually undetectable corrosive or caustic vapors can cause significant damage to lab equipment over time when ventilation is poor. Laboratory workers are equally susceptible to low-level exposures.

AIR- CHANGES:

1. In order to maintain proper dilution of contaminants, laboratories shall maintain an air exchange rate of 10-12 changes per hour. Animal holding areas shall maintain an exchange rate of 12-15 changes per hour (NIH publication 86-23, Guide for the Care and Use of Laboratory Animals). Some specialized areas may require greater rates. (Note: These are maintained air changes with dirty filters and worn belts. etc.)

BALANCE:

1. All laboratories shall be maintained at an air pressure that is negative relative to corridors and all non-laboratory areas. An exception will be made for those areas designated as "clean rooms" in which materials being used in these areas must be protected from outside contamination. This would include certain cell culture rooms and pathogen-free animal housing areas.

SUPPLY AIR:

1. The source for supply air must be remote from the street level and other sources of potentially contaminated air, i.e. hood exhaust stacks, emergency generator exhaust stacks, etc. Separate filtration of the outside air shall be provided with a minimum of 85% efficient filters and 2” thick 30% pre-filters before the air passes through the air handling unit.

FILTRATION:

1. Filtration for supply air will vary with the activity planned for the laboratory space. According to ASHRAE guidelines, conventional physics and chemistry laboratories commonly have 85 percent efficient filters for the supply air. Biomedical laboratories usually require 85 to 95 percent efficient filters. HEPA filters may be

required for specialized work that is particularly susceptible to outside contamination.

SUPPLY DISTRIBUTION:

1. Room air currents have a large effect on the performance of equipment in a laboratory, especially a fume hood or bio-safety cabinet. Thus the design of the room air supply distribution system is as important in securing good hood performance as is the face velocity of the hood.

2. The terminal throw velocity of supply air jets should be no more than 1/2 to 2/3 the hood face velocity; such terminal throw velocities are far less than conventional practice.

3. Perforated ceiling panels are required to have an average panel face velocity of <66 fpm and must be located away from the hood face. These provide a better supply system than grilles or ceiling diffuses in that the system design criteria are simpler and easier to apply, and precise adjustment of the fixtures is not required. Perforated ceiling panels should be placed so that approximately one-third or more of the panel is more than 4 feet from the hood. All perforated ceiling panels shall be aluminum construction, and easily removed without the use of tools for periodic cleaning.

4. Ceiling diffuses are required to maintain an average terminal throw velocity of <66 fpm and must not be located immediately in front of the hood. The quadrant facing the hood must be blocked off in a way that will prevent re-opening.

5. Office areas in laboratory buildings or laboratory areas shall be maintained at a pressure that is positive relative to the corridor and adjacent laboratory spaces.

EXHAUST AIR:

1. All air exhausted from chemical, biological and radioactive laboratory spaces, laboratory hoods, and other special local exhaust systems shall not be recirculated because it may expose both personnel and research materials to airborne contaminants and flammable fumes and vapors.

2. Air exhausted from laboratory work areas shall not pass un-ducted through other areas.

3. Air exhausted from laboratories shall be discharged through a duct system that is maintained at a negative pressure relative to the pressure of normally occupied areas of the building. (Exhaust fan at exhaust terminal.)

4. Non-contaminated air within individual laboratory areas may be reconditioned for energy conservation purposes (e.g. fan coil).

5. Exhaust air shall be discharged remote from the street level, areas of human occupancy, and fresh air intakes. (Roof exhaust shall be a minimum of (7) seven feet above the roof with a vertical low loss terminal.)

LABORATORY FUME HOODS:

DEFINITIONS:

1. For the purpose of this section, the following terms shall have the meanings given below:

   A. **Auxiliary Air**. Supply or supplemental air delivered to a laboratory hood to reduce room air consumption. The balance of supply air in auxiliary fume hoods is essential. Poor designs can blow contaminants out of the hood into the room. The supply air shall be tempered to avoid worker discomfort. In addition, untreated air as much as 20 F warmer than the room will degrade the room air conditioning. If the laboratory room air is to be maintained at some specified condition temperature, humidity or perhaps cleanliness, the use of auxiliary air hoods may not be economical or energy-conserving as compared to conventional fume hoods with redesigned room air supply. This hood design is not recommended for use at UAB.

   B. **Bypass Hood**. A fume or isotope hood equipped with an airflow-compensating opening that maintains a relatively constant volume exhaust through a laboratory hood regardless of sash position. It serves to limit the maximum face velocity as the sash is lowered. (A room exhaust grille controlled with the supply, hood exhaust, and necessary space exhaust to maintain the required negative pressure is usually used with VAV labs.)

   C. **Canopy Hood**. A suspended ventilating device used only to exhaust heat, water vapor odors, and other nonhazardous materials. This is not a laboratory hood and is generally not effective for exhausting toxic or flammable materials and is not permitted for that purpose.

D. **Deflector Vane.** An airfoil-shaped vane along the bottom of the hood face which directs incoming air across the work surface to the lower baffle openings. The opening between the work surface and the deflector vane is open even with the sash fully closed.

E. **Face** (of hood). The hood opening or the plane of the inside surface of the sash. This area is used to calculate the square footage of hood opening, and face velocity is measured in this plane.

F. **Face Velocity.** The rate of flow or speed of air moving into the laboratory hood face or access opening. At UAB, chemical fume hoods and radioisotope hoods are required to maintain a face velocity of 100 feet per minute (fpm) + 20%.

G. **Certification.** Fume hoods, radioisotope hoods, and biological safety cabinets are required to be certified by the Department of Occupational Health and Safety's Laboratory Ventilation Specialist after installation and prior to use. Annual re-certification is also required. This procedure verifies that the hood or cabinet is performing according to the specifications and the intended use. The hood or cabinet will be labeled as certified with the certifying individual's name and the date re-certification is required.

H. **Biological Safety Cabinet.** A special safety device designed to handle and contain biological materials. This enclosure is **not** a laboratory hood.

GENERAL REQUIREMENTS:

1. Fume hoods are an integral part of the laboratory ventilation system and as such must exhaust above and outside the building to assure that proper dilution is attained and that exhaust gases will not be re-ingested by the building fresh air intake and recirculated by the building heating, air conditioning and ventilation systems. Air from laboratory work areas shall not be recirculated. (All fume hoods shall comply with NFPA-45.)

2. Local exhaust systems for histology staining set ups, photographic developing laboratories, flame photometers, xenon-lamp spectrophotofluorometers, and similar equipment or locations are efficient, cost efficient devices for removing potentially harmful gases or vapors from the breathing zone of the laboratory worker and are at the same time capable of reducing fire danger by removing flammable vapor from the work area.

3. Hoods must be located in minimum traffic areas of the laboratory and in a manner that would not come between workers and their only exit from the work area should a fire or explosion occur in the hood.

4. Airflow indicators shall be installed on new laboratory hoods or on existing laboratory hoods, when modified. (These may be incorporated as part of the lab space temperature and pressure controls.)

5. Automatic fire dampers shall not be used in laboratory fume hood exhaust systems. Fire detection and alarm systems shall not be interlocked to automatically shut down laboratory hood exhaust fans.

6. Wood cabinets under structure are prohibited on all new installations.

DUCT REQUIREMENTS:

1. For most general purposes, duct work should be constructed of galvanized steel. Branch entries into a common duct should be of minimum loss design (30-45 degrees). Entries should be at the top or the side with no two entries on opposites sides and at the same point in the common.

2. Bends should be of minimal loss design. Bends (elbows) should be of 5-piece construction for diameters up to 6" and 7-piece construction for larger diameters. Prefabricated or smooth construction may be used. (Do not break galvanized coating in construction.)

3. Duct work should be supported in a manner as to prevent noise and vibration.

4. Type "B" biological safety cabinets require stainless steel duct construction to the point where a gas-tight damper is installed for decontamination purposes. Galvanized is acceptable downstream from the gas tight damper. The decontamination damper should be installed so that it is easily accessible and as close to the safety cabinet as transition will allow.

5. In fume hood installations that include a filer box, (all installations except as specifically exempted) duct work leading to the filter box shall be stainless steel. Galvanized is acceptable downstream from the filter box. The filter box shall be stainless steel with dimensions of 24"x 30"x 14" and include spaces for a pre-filter and HEPA or charcoal filter. Filter boxes shall be located and installed to allow easy access by ladder or other substantial support for filter removal and routine

maintenance. Access through light fixtures removal, etc. is not an acceptable means.

ROOF EXHAUST STACK ASSEMBLY:

1. Exhaust fans and their related assemblies shall always be located outside the building. The exhaust fan will discharge into an exhaust stack extending a minimum of seven feet above the roof and be a "no loss" design.

2. The discharge of exhaust air must be remote from the street area and all areas of human occupancy and fresh air intakes, both present and possible future locations. Although contaminant concentrations in the exhaust air is not of concern if the system is working effectively, odors and particulate matter make this air undesirable in occupied areas. The terminal velocity will be based on the table below:

RANGE OF TERMINAL VELOCITIES FOR HOOD EXHAUST STACKS:

Nature of Contaminant Range	Examples of Exhaust Material	Desired Velocity
Vapors, gases, smoke	All vapors, gases, smoke	l,000 to 1,200 fpm
Fumes	Zinc and aluminum oxide fumes	l,400 to 2,000 fpm
Very fine, light dust	Cotton lint,wood flour, litho powder	2,000 to 2,500 fpm
Dry dust and powders	Cotton dust, light shavings	2,500 to 3,500 fpm

PRE-CONSTRUCTION EVALUATION PROCEDURES FOR EXISTING RADIOISOTOPE HOODS, CHEMICAL FUME HOODS, AND BIOLOGICAL SAFETY CABINETS:

1. The following program will be utilized in the Department of Occupational Health & Safety to ensure the safety of contract workers involved in the renovation or removal of fume hoods in which radioisotopes, chemicals, and biological agents

are normally stored and used. The **Laboratory Ventilation Specialist (LVS)** will be involved in the inspection of these hoods.

2. The LVS must be notified **prior** to any work required on an isotope or chemical fume hood or biological safety cabinet.

3. The LVS will be the initial contract person regarding removal of any radioisotope or chemical fume hood or biological safety cabinet. He will schedule an appointment to meet with UAB new construction at the fume hood site to determine the nature of the problem.

4. Once this has been done, the LVS will determine what precautions will be required prior to starting work. At this time, appropriate surveys will be performed to ensure the equipment is hazard free. The contractor and UAB new construction and/or Architecture & Engineering will be notified of these results and the equipment will be tagged with a safety release form as ready for servicing.

5. After the work is performed on new installations, the LVS will certify the equipment as ready for use.

6. The LVS will report any deviation from the above procedure to the appropriate Safety Officer.

7. The phone number for the LVS is **205 934-9181.**

END OF STANDARD

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