# LABORATORY FUME HOODS

Fume hood design and selection shall incorporate the requirements of this section taken together with the requirements of Section 15910, Laboratory Ventilation.

**Related Sections**

Refer to Section SID-F for code and regulatory requirements.

Refer to Technical Sections listed below for additional UM design requirements which relate to fume hoods and which are to be incorporated into the specifications.

UM Master Specifications Sections listed below contain language which is typically used on projects designed by UM Architecture and Engineering Services (AES). These specifications are available for the use of outside A/E's but should not substitute for the design professional's judgment regarding project-specific requirements, except for specific situations in the Design Guideline where it is stated that the Master Specifications are to be incorporated.

UM Design Guideline Special Instructions to Designers
Section SID-F, Codes and Regulatory Agencies

UM Design Guidelines Technical Sections
12345 - Laboratory Casework
15060 - Basic Pipe and Pipe Fittings
15910 - Fume Hood and Laboratory Ventilation
16010 - Basic Electrical Requirements
16050 - Basic Electrical Materials and Methods
16500 - Lighting System

UM Master Specification Sections
11610 - Laboratory Fume Hoods
12345 - Laboratory Casework
15060 - Basic Piping Materials and Methods
15910 - Laboratory Ventilation
16010 - Basic Electrical Requirements
16050 - Basic Electrical Materials and Methods
16120 - Cable and Wire
16140 - Wiring Devices
16511 - Interior Lighting

## Fume Hood Design Requirements

**Selection and Design**

Proper selection of fume hood features is only possible after a thorough programming effort which includes input from the hood users. Programming should determine the types of work being conducted in the fume hood, the experience of the users, the materials which will be used in the hoods, and any special requirements for the hoods.

In the interest of obtaining a cost-effective fume hood installation, the designer should incorporate the features designated as "typical" in this Design Guideline unless a specific need or rationale has been identified during programming or design which makes an alternate selection a better choice. Alternate selections, accompanied by the reason for the selection, shall be presented to the University Project Coordinator for review.

Hood type and usage have a major impact on mechanical requirements and should be selected in close consultation with the Project Mechanical Engineer, University Project Coordinator and the University's Department of Occupational Safety and Environmental Health ( UM OSEH).

Laboratory fume hoods must comply with the requirements of ASHRAE Standard 110-95 As Manufactured, and relevant portions of NFPA 45.

## Types

Consult with University Project Coordinator and UM Occupational Safety and Environmental Health (OSEH) to determine type of materials to be handled, and hood requirements.

- Bench hood: designed to rest atop a counter or base cabinet, usually about 36" above the finished floor.
- Walk-in hood: used where taller apparatus is required or equipment is to be rolled into the hood. Walk-in hoods provide a minimum of 78" of working height.
- Perchloric acid hood: specially designed hoods designed to safely accommodate use of perchloric acid. Among other features, these hoods have a spray mechanism for washing down the hood and duct interiors. Perchloric acid hoods should have a label indicating suitability for use with perchloric acid procedures.
- Radioisotope (RI) hood: equipped with a welded stainless steel liner and coved stainless steel work surface

## Sash Type

Typically, specify fume hoods with a vertical rising sash. Specify combination sash when justified by the type of use of the hood. Do not specify combination sash in hoods of less than six feet nominal width.

## Sash Stops

All fume hoods shall be specified with sash stops. The stops shall be integral with the frame; add-on stops are not acceptable.

Height for sash stops: 14" from the work surface, with a clear opening height of 13" above the airfoil. For airfoils of unconventional design, adjust the location of the sash stop to maintain the 13" clear opening height.

**Work Surfaces**

Solid, Cast Epoxy Resin: For most fume hoods, specify epoxy resin tops, with recessed work area (dished to retain spills).

Stainless Steel: For specialty applications only. Usually will be specified, together with a coved stainless steel lining which is welded to the work surface to create a seamless installation, for RI and perchloric acid hoods. Specify units with adequate structural support for lead bricks or other shielding devices.

Lead Shielding: Design structural supports to support weight of shielding materials.

**Linings**

Linings must meet requirements of NFPA 45, paragraph 9-1.1 (flame spread less than 25). Linings which do not meet this requirement are not permitted. The following are possible choices:

- Fiberglass-Reinforced Polyester Resin Panels (FRP): This is typically the material used in fume hoods specified for UM projects. FRP is not resistant to quite as wide a variety of chemicals as cast epoxy resin and may not be appropriate for applications requiring a high heat resistance.

- Cast Epoxy Resin Panels: More resistant to chemicals and heat than fiberglass-reinforced polyester resin. Because of limited availability and high cost this material should only be specified when other materials are not suitable for the intended uses. Thin unreinforced epoxy resin liners are susceptible to damage during shipping.

- Stainless Steel: Not as chemically resistant as the resins, stainless steel should be used only in RI hoods, perchloric acid hoods and when high heat resistance is required.

- Others: Use of other liner materials is discouraged. Generally, other materials have a poor cost/benefit ratio compared with the choices listed above.

Baffles: For fume hoods to be installed in teaching labs or other locations where users may be unfamiliar with fume hood operation, UM recommends the installation of fixed baffles. In other locations, manually adjustable baffles (where available) are the recommended choice.

## Alarms

Audible and visual air flow alarms are required to be installed on all chemical fume hoods. Refer to Design Guideline Section 15910.

## Mechanical Service Fittings

Remote control fittings for water, gas, air, vacuum and similar services should be brass, with at least 81 percent copper content. Service fittings in fume hoods shall have a chemically resistant plastic coating. Fittings must be serviceable from the front of the fume hood.

Do not specify plastic fittings, except for deionized (purified) water outlets.

Protect the potable water supply with vacuum breakers or backflow preventers installed on the front face of fume hoods.

Specify factory piped units whenever possible. Piping within the fume hood shall match materials in Division 15 Mechanical Specifications.

Specify cupsinks which are designed to protect against spillage of chemicals into the sink. Cupsinks may be either side-mounted or mounted in the work surface (with a raised rim), depending on user needs.

## Electrical Service Fittings

Lights: Specify that each hood have a UL labeled, vapor-tight light fixture equipped with two F32T8 rapid-start, multi-phosphor fluorescent lamps with a medium bi-pin base, color temperature of $3500^{O}$K, and a CRI of not less than 75. Shield fixture from hood interior by 1/8 inch thick tempered glass panel. Units shall be located so that light tubes are easily replaceable from outside hood. Light switches shall be rated 120/277 volt, 20 amps, specification grade, extra heavy duty.

Receptacles: Unless there is a requirement for other voltages or configurations, specify 2 duplex outlets on the face of the hood; 125 volt, 20 amp, 2 pole, 3 wire, specification grade, extra heavy duty grounding type with nylon or Lexan bodies. Specify ground fault circuit interrupter receptacles in fume hoods and within 6 feet of fume hoods which contain sinks. GFCI receptacles shall be rated for 2000 amps interrupting capacity and trip in 25 milliseconds or less when ground currents exceed 5 milliamps.

Other Requirements: Usually specify ivory colored switches and outlets.

## Additional Superstructure Components

Consider the following components where appropriate:

- Enclosure Panels: Where the gap between suspended ceiling and top of fume hood will expose ductwork and equipment, consider specifying removable enclosure

panels to conceal dead space and neaten appearance. However, rooms without suspended ceilings rarely benefit from enclosure panels.

- Walk-in Hood Floors: Specify either a stainless steel or epoxy resin floor in walk-in hoods, constructed so as to retain spills, but tapered to facilitate ease of move-in for roll-in items.

**Base Unit Design Requirements**

Generally specify under each hood both a flammable/solvents storage base cabinet and a corrosives storage base cabinet, each equal to half the length of the hood. Where standard cabinet lengths make this impossible, or where special storage requirements dictate additional storage capacity, locate supplemental storage units elsewhere in the laboratory. If supplemental flammable/solvents storage cabinets are required, they shall not be located next to the hood superstructure. The following types of base cabinets can be provided in either wood or metal:

Corrosives Storage Units: Specify units vented external to the hood directly to the fume hood exhaust duct, and provide a detail on the Drawings illustrating this. Cabinets shall not be vented into the fume hood exhaust chamber itself. Usually include optional composition-board interior lining.

Flammable/Solvent Liquid Storage Units: Specify units meeting requirements of NFPA 30, paragraph 4-3.2.1 if metal; or NFPA 30, paragraph 4-3.2.2 if wood. Include requirements for 3-point latching mechanism (mentioned in 30-4-3.2.1, but not 30-4-3.2.2) if cabinets are constructed of wood. Flammable liquid storage cabinets should not be vented. If the client requests venting, special review with UM OSEH is necessary.

Consider possible conflicts between flammable storage base cabinets and cupsinks. Some manufacturers have this conflict resolved for their standard cupsink sizes and locations, while others do not. Non-standard placement or non-standard size of cupsinks may also cause problems. Avoid placing cupsinks over flammable storage base cabinets unless the condition can be resolved by the casework manufacturer.

Coordinate the specification of base cabinets with that of fume hoods so that a mismatch between the depths of the hood and the base cabinets is avoided.

**Biological Safety Cabinets, Tissue Culture Hoods and Laminar Flow Hoods**

Before specifying these units, verify with the University Project Coordinator that they are to be included as part of the fixed construction. Selection of the type, size and class of these units shall be made by the University Project Coordinator and OSEH representative in coordination with the Design Engineer.

## Fume Hood Testing

Specify that laboratory fume hoods must be tested to meet or exceed ASHRAE 110-95 As Manufactured (AM) testing at breathing zone concentrations of not more than 0.05 parts per million (ppm) with a 4 liter per minute tracer gas emission rate.

The 0.05 performance level may be inadequate for lab hoods which are to be used for extraordinary purposes, such as those involving highly toxic chemicals, high production volumes, or high-hazard radioactive materials. In such cases, the University Project Coordinator and UM OSEH shall provide direction regarding alternative AM or As Used (AU) testing.

In some locations, additional As Installed (AI) testing may be required for a certain percentage of fume hoods. This is most likely to occur in new research buildings. The University Project Coordinator and UM OSEH will provide direction regarding whether AI testing is required and, if so, how many fume hoods are to be tested.