Chemical Fume Hood Guide Design, Construction, Health and Safety

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To create airflow into the hood, an exhaust blower “pulls” air from the laboratory room into and through the hood and exhaust system. A baffle, airfoil, and other aerodynamically designed components control the patterns of air moving into and through the hood.

II. Construction, Installation, and Renovation

Listed below are the guidelines to be followed as part of the fume hood construction, installation, or renovation process. These guidelines are divided into nine categories: Laboratory Design, Fume Hood Construction and Installation, Ductwork, Exhaust Fan, Exhaust Stack, Plumbing, Electrical, Utility Service Fixtures, and Sashes.

1. Laboratory Design

Fume Hoods must be located away from heavy traffic aisles and doorways so that persons exiting the lab do not have to pass in front of the fume hood. The potentially dangerous portion of an experiment is usually conducted in a fume hood. Many lab fires and explosions originate in fume hood and a fume hood located adjacent to a path of egress could trap someone in the lab.
There must be two exits from rooms where new fume hoods are to be installed. If this is not feasible, the fume hood must be situated on the side of the room furthest from the door. A fire or chemical hazard, both of which often start in a fume hood, can render an exit impassible. For this reason, all labs with fume hoods are required to maintain two unblocked routes of egress.

Fume hoods must not be situated directly opposite occupied work stations.

Materials splattered or forced out of a hood could injure anyone seated across from it.

- Fume hoods should be so located within the laboratory to avoid cross currents at the fume hood face due to heating cooling, or ventilation supply or exhaust diffusers. Cross currents outside a hood can nullify or divert air flow onto a hood, negatively affecting its capture ability.
- Sufficient makeup air must be available within the laboratory to permit fume hoods to operate at their specified face velocities. A fume hood exhausts a substantial amount of air. Therefore, additional makeup air must be brought onto the room to maintain a proper air balance.
- Windows in labs that have fume hoods must be fixed closed. Breezes coming in through open lab windows can adversely affect the proper functioning of the hood. Turbulence caused by these wind currents can easily bring the contaminated air inside the hood back into the laboratory.
- Safety devices such as deluge showers, eye wash stations, fire extinguishers, and fire blankets should be located convenient to the fume hood operating personnel.
- Fume hoods shall not have an on/off control accessible in the laboratory, unless the lab has an alternate exhaust ventilation system or the exhaust is being filtered through a charcoal or HEPA filter. Fume hoods are an integral part of the entire laboratory's air balancing system which must be maintained. Labs must be maintained under positive pressure and when a fume hood is turned off the lab can develop positive pressure.

2. Fume Hood Construction and Installation

Supply or auxiliary air hoods are unacceptable for new fume hoods installations. It is very difficult to keep air supply and exhaust of supply hoods properly balanced. In addition, the supply air is intemperate, causing discomfort for those working in the hot or cold air stream.

- Constant volume bypass fume hoods are recommended. These hoods permit a stable air balance between the lab's ventilation system and the fume hoods exhaust by incorporating an internal bypass feature. This allows a constant volume of air to be exhausted through the hood regardless of sash position. Variable volume systems may be acceptable if properly designed.
- Portable, non-ducted fume hoods are not allowed except for limited uses as approved by RMS. Non-ducted fume hoods utilize filters which may be overwhelmed in the event of a spill. Breakthrough can also occur as the contaminant is dislodged with the sudden changes in air flow velocity associated with turning the blower on and off. In addition, an adequate level of protection cannot be assured for different classes of chemicals.
- Interior fume hood surface should be constructed of durable, corrosion resistant, nonporous, noncombustible, fire resistant materials such as stainless steel or special composite or polymer material. Corrosive materials can damage many types of materials, shortening fume hood life. In addition, some materials, when exposed to direct flame, emit noxious and toxic fumes.
- The work surface inside the fume hood must be of the recessed type. With a recessed type work surface, spills can be effectively contained by the retaining lip.
- Plastic or fiberglass hood are unacceptable. Although some plastic and fiberglass containing construction materials may be noncombustible, when involved in a fire they generate large quantities of dense, potentially toxic smoke. This smoke presents a hazard to both building occupants and fire fighters.
- An airflow indicator must be provided at the fume [illegible]

a. If gang ducting of fume hoods is necessary, the system must be properly designed with

- Hot or cold water supplies must be connected to non-

are frequently used. For additional information or consultation contact RMS at extension 54226.

- Laboratory fume hoods designated for use with perchloric acid shall be identified by a label indicating suitability for use with perchloric acid procedures.
- All exposed hood and duct construction materials shall be suitable for use with perchloric acid inorganic, nonreactive, acid resistant and relatively impervious.
- The work surface in the hood shall be water tight and dished or furnished with a raised bar to contain spills and wash down water.
- The fume hood and exhaust ducting design shall be provided with a water spray (wash down) system. The baffle must be removable to allow for periodic cleaning and inspection.
- Each perchloric acid fume hood must have an individually designated duct and exhaust system. The duct system should be straight, vertical and as short as possible.
- Use only an acid resistant metallic fan.
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The authorized user or his assistants shall promptly notify the RSO of any spill, accident, or any operation which may have contaminated the hood or released any contamination.

- The user shall provide documentation of his or her radiation and contamination surveys of the hood to the RSO. The user may directly supervise work without RSO approval, and then assumes responsibility for radiation safety.
- All radiological fume hoods and exhaust blowers shall be labeled – "CAUTION – Radioactive Material" and exhaust stacks shall be stripped magenta.

3. Iodination Mini Hoods

The Radiation Safety Officer shall be contacted before an iodination mini hood is installed. Iodination mini hoods must be located within an already operative laboratory fume hood. Each mini hood must be equipped with a charcoal filter.

The mini hood should be compatible with the laboratory fume hood with respect to size and airflow.
Air flow through the arm portals should be maintained at 150 linear feet per minute. Plexiglas construction is recommended.

IV. Testing, Servicing, and Dismantling

During routine servicing and repair or dismantling of a laboratory fume hood the potential exists for exposure to hazardous substances that had been used or stored in the hood. To guard against this, certain protective measures, appropriate to the specific situation, should be implemented before work begins.

1. Fume Hood Evaluation in the Field

Evaluation of new or refurbished laboratory fume hoods shall be performed by the installer prior to releasing the fume hoods for use. Tests shall be performed by qualified personnel to verify proper operation of the fume hoods.

Average face velocities shall be checked by RMS once per calendar year.

- Verify that the building makeup air system is in operation, the doors and windows are in normal operating position, and that all other hoods and exhaust devices are operating at design conditions.
- Check room conditions in frontesances t alf( )10.1(aDc 0.ng)-10.7(m)-14ig i

Manual, 25th (2004) Edition American Society of Heating, Refrigerating and Air Conditioning Engineers

(ASHRE), Fundamental Handbook American Society of Testing Materials (ASTM) E 162

National Fire Protection Association (NFPA), Exhaust Systems for Air

Conveying of Materials, NFPA 912004

National Fire Protection Association (NFPA), Fire Protection for Laboratories Using Chemicals, NFPA 452004 Occupational Safety and Health Administration, Occupational Exposures to Hazardous Chemicals in Laboratories, 29CFR 1910.1450