Laboratory Fume Hoods

FACT SHEET 55-023-0513

INTRODUCTION: A Laboratory Fume Hood is a ventilated enclosure designed to contain any exhaust fumes, vapors, mists and particulate matter generated within the hood interior. Not to be confused with a biological safety cabinet (BSC), often referred to as a "hood" and designed primarily for work with microorganisms or pharmaceutical products, fume hoods are usually found in laboratories that routinely use chemicals. Fume hoods are designed to protect the operator but they do not offer product or environmental protection as BSCs do. More details on the comparison of chemical fume hoods with BSCs can be found on the Public Health Command website under topics and services-Industrial Hygiene: http://phc.amedd.army.mil/topics/workplacehealth/ih/Pages/default.aspx.

HOOD TYPES: There are numerous types of hoods used in laboratories. These include conventional hoods as well as specialty hoods, such as perchloric acid and radioisotope hoods. All of these hoods fall into one of two categories based on principle of operation: Constant Air Volume and Variable Air Volume.

Constant air volume (CAV) – this design maintains a constant volume of exhaust airflow allowing the face velocity to change as the sash moves up or down.

- The face velocity is inversely proportional to the sash height.
- Two types of conventional hoods in common use (bypass and auxiliary hoods) are variations of CAV hoods. Bypass hoods allow additional airflow into the hood when the sash is lowered limiting the face velocity.
- Auxiliary hoods utilize a secondary air source (powered or not powered) to provide unconditioned or partially conditioned outside air into the hood reducing the amount of conditioned air used as an energy cost saving measure.

Variable air volume (VAV) – these hoods vary the exhausted air volume to maintain a constant face velocity regardless of the sash position.

- The system continuously measures the exhaust air and makes adjustments to maintain the required face velocity. This design is more efficient than the older CAV hoods as it reduces air volume required when the hood is not in use thus reducing operating/energy costs.
- In addition, maintaining a constant face velocity using VAV technology increases the hood's ability to contain vapors and gases and reduce overall operator exposures.
- One downside to VAV technology may be the "lag" or response time delay between the hood ventilation system change of airflow velocity/ negative pressure to change in sash height position.
- Some systems may experience a response time delay when the expected face velocity airflow into the hood is not as required (e.g., face velocity is too low or too high).
- A delay may be normal and should be expected. Laboratory personnel should be instructed to not work in the hood immediately after the sash height is changed until the ventilation system has self-corrected the airflow and the "lag" time has passed.

The American National Standard Institute/American Industrial Hygiene Association Laboratory Standard ANSI/AIHA Z9.5-2003, Laboratory Ventilation requires "All laboratory fume hoods to be equipped with a flow indicator, flow alarm, or face velocity alarm indicator to alert the users to improper exhaust flow."

TESTING: Face velocity is often used as a primary indicator of hood performance. Face velocity alone does not adequately measure hood performance.

- The Department of Defense Manual DODM 6055.18-M, Safety Standards for Microbiological and Biomedical Laboratories specifies three different hood performance criteria to be used when testing laboratory fume hoods: 1) Hood Face Velocity, 2) Cross Drafts and 3) Hood containment aerosol (smoke) tests.
- Hoods must be certified using at least these three performance criteria in accordance with ANSI/American Society of Heating Refrigeration and Air-Conditioning Engineers (ASHRAE) Standard 110-1995, Method for Testing Performance of Laboratory Fume Hoods.
- The testing must be done at least annually and whenever the system has undergone repairs, maintenance, a filter change, or when a significant change has been made to the operational characteristics of the system.
- It is important to note that many factors such as hood design, laboratory layout, work procedures, cross drafts from personnel and other equipment may have an effect on hood performance.
- Exposure monitoring should be included in the evaluation process to ensure that hood containment is adequate and occupational exposure levels for chemicals being used are not exceeded.

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