

Chapter 7: ENGINEERING CONTROLS

The OSHA Laboratory standard requires that engineering controls (e.g. chemical fume hoods and general ventilation equipment) function properly and are adequately maintained. Additional protections are required by the Lab Standard for employees working with particularly hazardous substances. It is the College's responsibility to provide the following controls where they are needed to protect employees and to ensure that:

- general ventilation systems and fume hoods are functional and meet the requirements for procedures performed;
- personal protective equipment (PPE) is appropriate and available;
- emergency safety equipment is sufficient and accessible.

General Ventilation

General ventilation is defined as a system by which air is mechanically *supplied* to a space through air-supply ducts, and *exhausted* from a space through exhaust ducts. (In laboratories, exhaust is usually through chemical fume hoods only.) Air is supplied to laboratories at a rate of 8-14 room-air changes per hour. Flammable Storage Rooms must have 6 room-air changes per hour. In laboratories and storage rooms, air is 100% fresh outside air, 0% recirculated; air removed from laboratories/storage rooms is vented directly to the outdoors. A slightly negative pressure should be maintained in laboratories to prevent escape of contaminants into uncontaminated areas. Intake vents for the system must be distant from the exhaust port to prevent cross contamination. These considerations will be taken into account in all future design and redesign of ventilation systems for laboratory use.

General ventilation will not be relied upon to protect employees from toxic exposures. *Local exhaust* equipment (e.g. chemical fume hood) must be used for this purpose.

Fume Hoods

Fume hoods minimize personal risk of exposure to toxic and hazardous materials by isolating the hazard from the worker by capturing chemical vapors, fumes and mists at their source, preventing them from entering the general laboratory environment. Their use is encouraged whenever possible, and mandated for certain substances and procedures, as outlined below. Check fume hoods before use to ensure adequate functioning. Send a hood maintenance request to Buildings & Grounds (x8180) if there is a problem and contact the CHO (x8978) if the problem is not addressed immediately.

Performance Requirements:

FDNY regulations require that all fume hoods be vented so that an average minimum face velocity of 100 linear feet per minute (100 ft/min, 100 fpm) is achieved at a sash height of 12"-18". The Maintenance and Inspection Program for laboratories of this institution, described in Chapter 9 of this Plan, will ensure that fume hood performance is routinely assessed and systems are maintained.

Ventilation Ducts:

Common ducts may be used only for fume hoods located in the same laboratory unit (defined as an enclosed fire-rated space that may contain more than one separate laboratory work areas). Hoods in different laboratory units should not have combined ducts. Duct work must be arranged so that exhaust from one duct cannot be forced out through any other hood served by the common duct.

Examples of when chemical fume hoods are required:

- When the chemical is a known or suspected carcinogen, reproductive hazard, sensitizer, or acutely toxic chemical;
- When handling large quantities of chemicals (>500mL of liquid or >30g of a solid);
- When working with flammable, volatile, and/or reactive substances;
- When conducting unpredictable or unreliable procedures or reactions.

Chemical Fume Hoods Required Work Practices

- Laboratory employees must check fume hoods' functioning before use and employ work practices which optimize protection afforded by fume hoods. Methods for evaluating fume hood performance will be covered in employee training, including:
 - Continuous monitoring devices (face velocity monitors)
 - Smoke tube tests
 - Velometers
 - Kimwipes on bottom edge of sash
- Immediately report all improperly functioning fume hoods to the laboratory supervisor or director. It is their responsibility to ensure that fume hoods in their laboratories work properly;
- Do not block vents with stored chemicals, which interferes with proper airflow;
- Do not store open chemical- and waste containers in hoods, which can evolve vapors, mists, dusts into the environment;
- Close hood sashes and turn off fume hood exhaust fan when not in use. If chemicals remain in the hood after use, the fan must be left on;
- Lower the sash to proper working height (12-18") when in use;
- Reduce turbulence in the hood by closing lab doors and windows, opening and closing the sash slowly and smoothly, and by avoiding rapid movements inside the hood;
- Work at least 6" inside the hood to ensure containment of chemical vapors;
- Connect electrical equipment to outlets *outside* the hood. In an emergency one can disconnect equipment without creating a spark inside the hood. Be cautious of tripping hazards with the cords.
- Wash the hood work surface as often as necessary to maintain a clean, dry surface.

Handling (and heating) perchloric acid, strong oxidizing agents, or other highly reactive chemicals must be performed in specially-designed fume hoods served by an independent duct. In other words, only the correct type of fume hood *installed correctly* may be used for this work. If you are unsure of whether this is the case when using these materials, DO NOT PROCEED WITH YOUR WORK. Contact the Facilities Office to determine if hoods are independently ducted.

When fume hoods are not operating properly, they must NOT be used. Where there is reason to believe that laboratory employees would be unnecessarily exposed to toxic chemicals due to the failure of a hood to function properly, then activities must cease. See Chapter 6 for more specific operating procedures for fume hood use with particularly hazardous chemicals.

New Construction and Installation of Fume Hoods

The Chemical Hygiene Committee will be consulted in advance of plans for any new construction of fume hoods in laboratory facilities to ensure that safety regulations and intended use are considered.

Inspection and Maintenance

The CHO will coordinate the maintenance and inspection of facilities, general ventilation systems, fume hoods, and emergency facilities and equipment such as eyewash stations, safety showers, fire extinguishers, and self-contained breathing apparatuses in laboratories, storage areas, and preparation rooms. The frequency of these inspections and maintenance programs are described in Chapter 9. Maintenance and Inspection programs will target areas in which particularly hazardous chemicals and/or procedures are used.

Employee Reporting of Improperly Functioning Equipment

Between maintenance and inspection intervals, all laboratory employees must report improperly functioning fume hoods, general ventilation systems, safety showers, and eyewash stations and other safety equipment to Buildings & Grounds using a standard Work Order form.

Availability of Equipment

Each department supervisor, will complete and maintain a checklist identifying the types and approximate number of safety items required for each workspace in that department. The checklist will be made available to the CHO upon request. Each supervisor must ensure that the choice of all safety equipment is based on an evaluation of the hazards of procedures and chemicals used in each laboratory.

Each department must ensure that any necessary equipment is ordered, received and made available to employees. Safety equipment checklists will be reviewed during biannual inspections by the CHO and Committee.