C-13. LABORATORY VENTILATION MANAGEMENT PROGRAM

I. SCOPE

This program establishes the requirements for the design, maintenance, testing, and operation of laboratory ventilation systems. It applies to all laboratory facilities at NCI-Frederick.

II. PURPOSE

The purpose of this program is to establish minimum requirements and procedures for laboratory ventilation systems designed and used to prevent personnel from overexposure to harmful or potentially harmful contaminants generated within the laboratory.

The NCI-Frederick, through the EHS, has developed a comprehensive Occupational Safety and Health program to protect the safety and health of all employees on the campus. Safety and health regulations and guidelines require the use of engineering controls (such as exhaust ventilation) as the primary means for minimizing the potential for occupational exposure to hazards in the workplace.

Engineering controls for protecting occupational safety and health shall be designed into facilities for both new construction and renovated space. This proactive approach minimizes numerous common potential health and safety concerns in laboratory facilities. These health and safety guidelines shall be incorporated, as appropriate, in facility-specific construction documents by the Architect/Engineer.

While many of the requirements for health and safety engineering are incorporated in these guidelines, it is unrealistic to cover all possible concerns. The design/engineer firm shall, whenever possible, have a health and safety specialist on staff and shall always consult with EHS personnel with regard to specific health and safety engineering requirements in the design of new construction and renovation projects.

III. DEFINITIONS

Adsorption filter - A type of air cleaning device where contaminant molecules in the gaseous phase adhere to the surfaces of a solid material (adsorbent). Activated carbon is a popular adsorbent used for this purpose.

Air cleaning device - A component of a ventilation system designed to remove contaminant materials from an airstream. The mechanism of cleaning may include: particulate filters, solid adsorbents (activated carbon), wet scrubbers, electrostatic precipitators, and others.

Auxiliary air hood - A chemical fume hood equipped with a supply air plenum outside the hood at the top and/or sides of the face opening to provide a downward-flowing air stream into open face of the hood.

Biological Safety Cabinet (BSC) - A special form of containment equipment (hood) featuring HEPA filtration used as a primary barrier to prevent the escape of aerosols into the laboratory environment. The various classes of BSC can provide product protection as well as user protection.

Bypass hood - A chemical fume hood designed so that as the hood sash is lowered, a proportional fraction of the exhaust is drawn through an opening in the hood structure instead of the remaining open face.

Chemical fume hood - A boxlike structure with one open side intended to contain and exhaust gases and vapors. The open side is equipped with at least one sash moving vertically or horizontally to close the opening. Various baffles and airfoils are incorporated to provide linear airflow across the face of the opening in accordance with ANSI Z9.5.

Dilution ventilation - Ventilation airflow that diminishes contaminant concentration by mixing with contaminated airflow -- as opposed to capturing the contaminant.

Ductless fume hood - A chemical fume hood that filters the exhaust air and returns it directly to lab space. Ductless hoods are prohibited at the FCRDC.

Exhaust air - Air that is removed from an enclosed space and discharged to the ambient environment.

Face velocity - Speed of air at the plane comprising the opening of an exhaust hood -- ordinarily the average of multiple observations within the plane.

High efficiency particulate air (HEPA) - A type of high efficiency air filter meeting a specification for minimum retention efficiency of 99.97% for 0.3-μm particles.

Laboratory - A defined space within a building, requiring the handling or utilization of relatively small quantities of hazardous chemicals on a non-production basis.

Makeup air - Outside air drawn into a ventilation system to replace exhaust air.

Room air balance - The air pressure differential and direction of flow for room air with respect to adjacent spaces and within the room.

Special purpose hood - An exhaust device, other than a CFH or BSC, designed to capture gases/vapors/particulates from various lab equipment/operations (commonly, chromatographs, flame/furnace spectrophotometers, dissection booths, liquid pouring stations, heat sources, etc.) These hoods might not meet the ANSI Z9.5 design criteria of a CFH, but they will meet any applicable design criteria, the design jointly approved by FME and EHS, and tested for technical performance.

Variable volume hood - A chemical fume hood (or CFH system) designed so the exhaust volume is varied in proportion to the opening of the hood face by changing the speed of the exhaust blower or operating a damper in the exhaust duct.

IV. RESPONSIBILITIES

A. Facilities Maintenance Engineering and Planning (FME) are responsible for designing, installing, maintaining and testing/documenting laboratory ventilation systems in accordance with this Laboratory Ventilation Management Program.

B. Environment, Health and Safety Program (EHS) are responsible for reviewing blueprints and conducting program audits for compliance with this Laboratory Ventilation Management Program.

V. CHEMICAL FUME HOODS

A. General requirements

Chemical fume hoods may be constant-volume or variable-volume exhaust hoods, depending on user and facility management considerations of function, initial cost, and life cycle cost issues. All containment devices shall be located in the laboratory to avoid entrapment, blocking of egress, or safety hazard to the lab occupant. All chemical fume hoods must conform to NCI-Frederick Specifications.

1. Chemical fume hoods will operate continuously and must achieve a face velocity of 100 fpm at an 18-inch sash height with a uniform face velocity profile of +/-20% of the average velocity. If equipped with a bypass it shall be designed so face velocity does not exceed the 120 fpm maximum as the sash is lowered.

2. Chemical fume hoods must have a flow-monitoring device connected to a local audio alarm and visual indicator within the laboratory where the alarm set point is 80 percent of design velocity.

3. A combination sash provides energy efficiency with the advantages of a vertical sash hood.

4. In accordance with NIH design policy, NCI-Frederick exhaust from chemical fume hoods and special purpose lab hoods may be tied into the laboratory general exhaust system. Such commingling of exhaust streams requires approval by EHS.

5. Fire dampers shall not be used in lab hood exhaust systems.

B. Chemical Fume Hood Exhausts

The discharge of air from chemical fume hoods shall:

1. Not be recirculated.

2. Be discharged in a manner and location to avoid reentry into the laboratory or adjacent building at concentrations above 20% of the allowable concentrations inside the laboratory under any wind or atmospheric conditions.

3. Be in accordance with the latest applicable ASHRAE standards.

4. Be located to avoid reentry, generally in a vertical-up direction at a minimum of 10 feet above the adjacent roofline.

5. Be exhausted from a stack at a discharge velocity of at least 3000 fpm.

6. Aesthetic considerations concerning external appearance of the building shall not be allowed to over-ride these requirements.

C. Special Purpose Hoods

Special purpose hoods may be used for operations for which other types are not suitable (e.g., enclosures for analytical balances, histology process machines, vents from spectrophotometers, chromatographs, etc). Such special purpose hoods shall be designed in accordance with ANSI Z9.2 and the ACGIH Industrial Ventilation

Manual, and all must be jointly approved by EHS and the applicable FME Maintenance Shop(s).

D. Auxiliary Supplied Air Hoods

The installation of auxiliary supplied air hoods is not recommended unless special energy conditions or design circumstances require their use. Hood users must fully understand and accept the inherent disadvantages of complexity, discomfort and potential hazards.

NOTE -- Other CFH designs, such as non-bypass combination sash CFH, yield equivalent energy savings.

E. Variable Volume Hoods

Variable volume hoods shall modulate supply air to maintain the design air balance between the laboratory and the adjacent areas. The mechanism that controls the exhaust fan speed or control damper position to regulate hood exhaust volume shall be designed so exhaust volume is not reduced until the sash is half-closed. Then, it is reduced in proportion with the sash closure to a minimum of 10% full-open face volume (i.e., the exhaust volume is not reduced to zero by the control; a separate on-off switch is required.)

If the maximum exhaust volume of variable volume hoods in one room exceeds 10% of the room air supply volume, and if the laboratory is designed for controlled airflow between laboratory and adjacent areas, automatic flow control devices shall be provided to reduce the supply air volume by the same amount that the hood exhaust volume is reduced.

NOTE -- These VAV systems require sophisticated testing equipment and training of maintenance personnel.

F. Ductless Fume Hoods

Ductless fume hoods, regardless of associated filtration devices, are explicitly prohibited as they recirculate potentially contaminated air to occupied space. This prohibition does not apply to properly installed Class II, Type A biological safety cabinets.

G. Chemical Carcinogens and Primary Containment Equipment

Procedures involving volatile chemical carcinogens and those involving solid or liquid chemical carcinogens that may result in the generation of aerosols shall be conducted only in a chemical fume hood, a Class I Biological Safety Cabinet, a glove box, or other suitable containment equipment. Tissue culture and other biological procedures involving chemical carcinogens may be conducted in a Class II, type B Biological Safety Cabinet. A Class II, type A/B3 Biological Safety Cabinet may also be used if the cabinet's exhaust air is discharged to the outdoors. (From NIH Guidelines for the Laboratory Use of Chemical Carcinogens)

VI. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

A. Lab Supply Air

The laboratory general HVAC systems must satisfy research laboratory demands. Temperature and humidity must be carefully controlled to meet ASHRAE requirements. Systems must have adequate ventilation capacity to control vapors/gases, odors, and airborne contaminants, permit safe operation of exhaust hoods, and cool the significant heat loads which can be generated in the lab. Supply air quantities may not be fully established by the room-cooling requirements and load characteristics. Additional supply air required to make up the differences between room exhaust requirements and primary supply may be designated (1) infiltrated supply, if induced indirectly from the corridors and other spaces or (2) secondary supply, if conducted directly to the room.

1. Laboratory HVAC systems shall utilize 100% outdoor air, conditioned by central station air-handling systems to offset exhaust air requirements.

2. Once supplied to a laboratory, air shall not be recirculated.

3. Supply air volume shall equal the exhaust volume less that of the air volume, if any, entering the lab thru openings from adjacent spaces that interferes with planned airflow.

4. Supply air distribution shall be provided at jet velocities of less than half (preferably less than one-third) of the capture or face velocity of the exhaust hoods. For most hoods this imposes a 50 fpm or less terminal throw velocity at six feet above the floor. For labs with a

large number of hoods, low-velocity perforated panels are necessary.

5. Supply air quality shall meet the technical requirements of ANSI/ASHRAE 62.

6. That portion of laboratory noise generated by HVAC systems shall be maintained at a maximum of 55 dB.

HVAC systems must be both reliable and designed to operate without interruption. HVAC systems must be designed to maintain relative pressure differentials between spaces and must be efficient to operate, both in terms of energy consumption and from a maintenance perspective. Federal energy standards must be achieved; however, opportunities for conserving energy resources shall not compromise health and safety issues nor hinder continuous research functions. An energy monitoring control system shall be provided in new construction and renovations, where feasible. Studies shall be conducted during the design phase to determine the feasibility of utilizing heat-recovery systems in research laboratory buildings.

B. Air Quality

HVAC systems must maintain a safe and comfortable working environment and be capable of adapting to new research initiatives. In addition, they must be easy to maintain, energy efficient, and reliable to minimize lost research time.

1. Adequate access shall be provided for appropriate periodic maintenance and cleaning of HVAC system components.

2. Outdoor air intakes shall be located as far as practical (on directionally different dimension) but not less than 9.0 m from exhaust outlets of combustion equipment stacks, cooling towers, ventilation exhaust outlets from the building or adjoining buildings, vacuum systems, plumbing vent stacks, or from areas that may collect vehicular exhaust and other noxious air emissions. The bottom of outdoor air intakes serving central systems shall be located as high as practical but not less than 1.8 m above ground level, or if installed above the roof, 1.0 m above the roof level.

3. Exhaust outlets shall be located a minimum of 3.0 m above ground, away from occupied areas or from doors and operable windows. The preferred location for exhaust discharge is above roof level. Care must be taken in locating potentially hazardous exhausts and discharges (e.g., engines, fume hoods, BSCs, kitchen hoods, spray painting booths, etc.) Prevailing winds, adjacent buildings, and exhaust discharge velocities must be taken into account to ensure that discharge is not entrained within an outdoor airstream.

C. Directional Airflow/Relative Pressurization/Airlocks

Control of airflow direction in research laboratories controls the spread of airborne contaminants, protects personnel from potentially hazardous substances, and protects the integrity of experiments. Airflow shall be from areas of lower hazard to higher hazard, unless the lab is used as a Clean Room (such as Class 10,000 or better) or animal surgery rooms.

1. Laboratories containing harmful substances shall be designed and field balanced so that air flows into the laboratory from adjacent (clean) spaces, offices, and corridors (i.e., laboratories must remain at a negative air pressure in relation to the corridors and other nonlaboratory spaces.)

2. Administrative areas in a laboratory building must always be positive with respect to corridors and laboratories.

3. Some laboratories, such as biohazard containment laboratories and tissue culture laboratories, require control of relative pressurization. The HVAC system must be capable of maintaining these special relative pressure requirements, which are presented in the CDC/NIH publication Biosafety in Microbiological and Biomedical Laboratories. When flow from one area to another is critical to exposure control, airflow monitoring devices shall be installed to signal or alarm a malfunction.

4. For critical air-balance conditions (e.g., BL-3 labs, clean rooms, etc.), a personnel entry/exit anteroom with controlled airflow is required to provide a positive means of air balance control.

5. Loading and receiving docks must be maintained under positive pressurization to prevent the entrance of vehicle exhausts.

D. Ventilation Rates

The ventilation rate for laboratory HVAC systems is driven by three factors: chemical fume hood and BSC demand, cooling loads, and removal of vapors/gases and odors from the general laboratory work area.

1. The minimum air-change rate for laboratory space is six air changes per hour regardless of space cooling load. Some laboratories may require significantly higher rates to support fume hood demand or to cool high instrument heat loads in equipment laboratories.

2. Implementation of a recirculating-type HVAC system for administrative areas may be utilized for energy conservation. Recirculating air systems shall provide ventilation conforming to ASHRAE Standards and must not affect the pressurization and balance between laboratory and administrative zones.

3. Recirculating systems of administrative areas shall be completely separate from 100% outdoor air laboratory systems.

E. Exhaust Discharge Air Cleaning

Laboratory general exhaust air, normally, does not require filtration or scrubbing to meet EPA/MDE requirements -- however, the use of dust-stop filters to prevent the accumulation of material on heat recovery devices may be warranted for purpose of preventive maintenance. However, in special laboratories using radioisotopes, or certain hazardous chemicals or in biocontainment laboratories, exhaust air may require special scrubbing or filtration before discharge to the atmosphere. Generally, for employee safety this would necessitate the installation and use of bag-in/bag-out filter caissons. FME shall consult with EHS for specific requirements.

F. Air Distribution

Air supplied to a laboratory space must keep temperature gradients and air turbulence to a minimum, especially near the face of the laboratory fume hoods and BSCs. Supply air outlets must not discharge into the face of fume hoods or BSCs. Large quantities of supply air can best be introduced through perforated plate air outlets or diffusers designed for large air volumes. The air supply shall not

discharge on a smoke detector, as this slows its response or on a rate-of-rise heat detector, as it can cause false alarms.

G. Energy Conservation

The Building Official and Code Administrators (BOCA) National Energy Conservation Code shall be utilized to regulate the design and construction of the exterior envelopes and the selection of HVAC and equipment required for the purpose of effective use of energy, and shall govern all buildings and structures erected for human occupancy. When requirements of the energy conservation code cannot be satisfied because of program requirements, the NCI-Frederick Project Officer shall be notified.

The quality of the building environment shall be supportive of the health and safety of building occupants. Opportunities for conserving energy resources shall not compromise health and safety issues nor hinder continuous research functions.

VII. **MANIFOLD HOOD SYSTEMS**

Two or more exhaust systems may be combined into a single manifold and stack if all the following conditions are met:

1. The manifold is designed as a plenum under negative pressure.

2. The exhaust stream components are chemically compatible.

3. Continuous maintenance of adequate suction in the manifold is provided by a backup manifold exhaust fan and emergency power to the manifold exhaust fans. When emergency power is not available, only hoods in the same room may be manifolded.

NOTE - The exhaust system of radio-iodination hoods must be entirely separate from other ventilation components and are thus prohibited from manifold ventilation systems.

VIII. **AIR CLEANING**

A. Supply Air

Lab supply air systems seldom require air cleaning for H&S reasons. It is often provided for technical reasons, usually to reduce the contamination from atmospheric dust and dirt. The filtration necessary for supply air depends on the activity in the laboratory. Conventional chemistry and physics laboratories commonly have 85% efficient filters, based on ASHRAE Standard 52-76 Test Method. Biomedical laboratories usually require at minimum 85% efficient filters.

1. Preventive maintenance obligates supply air for all laboratory systems to be filtered on the upstream side of fans with at minimum 30% efficient pre-filters and at minimum 85% efficient after-filters.

2. HEPA filters may be warranted in special laboratories where research materials or products are particularly susceptible to contamination from external sources. HEPA filtration of the supply air is considered necessary in only the most critical applications such as environmental studies, dust-sensitive work, and electronic assemblies. In many instances, conducting sensitive work in a BSC, rather than providing HEPA filtration for the entire room, is satisfactory. HEPA filtration shall be provided as required by the program requirements for individual applications.

B. Exhaust Air - Room HVAC

Generally, room HVAC systems do not require air cleaning prior to release to the environment. EHS and FME will review program requirements to determine the need for cleaning general exhaust from laboratories (i.e., areas used for work with select carcinogens, select biohazards, reproductive toxins, or substances which have a high degree of acute toxicity). In cases where air cleaning devices are installed, exhaust filter assemblies shall be provided with a damper, instruments and controls that:

Indicate static pressure differential separately across primary and secondary filters and the pressure differential across both filters and the damper.

1. Actuate a motor to open damper from initial partially closed position when filters are clean to a full open position when filters are fully loaded.

2. Actuate a signal or alarm when the pressure drop across the primary or

secondary filter reaches .1-inch w.g. more than the rated pressure drop.

3. HEPA filter installations shall be tested for leaks, all leaks repaired, or the filter replaced before use.
4. Bag-in/bag-out filter caissons that greatly reduce or eliminate worker exposure are to be used whenever feasible.
5. Bag-in/bag-out filter caissons shall be equipped with aerosol challenge test ports for in-situ testing of HEPA filters.
6. Bag-in/bag-out filter caissons shall be fitted with 100% dampers to permit filter decontaminations.

C. Exhaust Air - Chemical Fume Hoods

Generally, exhaust air from laboratory hoods is not cleaned prior to release because of dilution capability when the exhaust is discharged in accordance with section V.B - Chemical Fume Hood Exhausts. However, certain laboratory operations require special effluent treatment (e.g., radioiodine hoods, perchloric acid hoods, and others designated by EHS.) In cases where air cleaning devices are installed in chemical fume hoods, the requirements of VIII.B. also apply.

Exhaust Air from Primary Containment Equipment. The exhaust air from glove boxes shall be treated by filtration, reaction, absorption, adsorption, electrostatic precipitation, or incineration. The need for and type of treatment of exhaust air from other primary containment equipment, including open face laboratory-type hoods shall be determined by the EHS in consultation with the principal investigator. Treatment systems that remove chemical carcinogens from the exhaust air by collection mechanisms such as filtration, absorption and adsorption shall be operated on a manner that permits maintenance so as to avoid direct contact with the collection medium, in accordance with Section VII.B.

IX. PREVENTIVE MAINTENANCE & FILTER REPLACEMENT

1. Hood users shall be notified <u>before</u> any maintenance is to be performed so work in the hood can be halted during maintenance.

2. Maintenance personnel shall be required to use appropriate PPE (such as

respirators, goggles or face shields, gloves, and protective clothing) whenever work involves hazard exposure.

3. Equipment to be removed to the shop shall be decontaminated before removal.

4. Equipment being shut down for inspection or maintenance shall be secured (locked/tagged out) during such maintenance.

5. All toxic or otherwise dangerous materials on or in the vicinity of the equipment shall be removed or cleaned up before maintenance.

6. If maintenance activities involve contact with potentially contaminated parts of the system, these parts shall be evaluated first by EHS.

X. DUCTWORK

Lab ventilation ductwork shall comply with appropriate SMACNA (Sheet Metal & Air Conditioning Contractors National Association) standards. Exhaust ductwork shall be designed in accordance with ANSI Z9.5 and ASHRAE Fundamentals Handbook. Systems and ductwork shall be designed to maintain negative air pressure in the ductwork inside regularly occupied parts of the building.

1. The use of exposed fiberglass or any fibrous material that allows fibers to break off into the airstream for interior lining or insulation is prohibited for ductwork and air-handling units.

2. Sound attenuators with suitable linings or other approved means of noise control shall be used where required.

3. When required, insulation and vapor seal insulation shall be installed on the outside of ductwork to prevent condensation.

XI. VACUUM SYSTEMS

Vacuum pump systems will have hydrophobic (water-resistant) filters on the suction side, with the exhaust to outside of the facility and not into mechanical spaces. Filter housing shall be designed for easy replacement of the filter, with maximum protection of maintenance employee from possible contamination.

1. Vacuum systems shall be protected with appropriate filtration (0.3 micron

hydrophobic filter or the equivalent) to minimize the potential for contamination of vacuum pumps.

2. Filters shall be on the suction side of the pumps, with exhaust to the outside of the facility and not recirculated into the mechanical spaces.

3. Filters shall be located as close as possible to the laboratory in order to minimize the potential contamination of vacuum lines and to preclude and minimize decontamination and decommissioning costs.

4. Filter housings shall be designed for easy filter replacement in order to minimize the possibility of maintenance worker contamination and to provide for easy disposal.

XII. TESTING & INSPECTIONS

1. The NCI-Frederick Chemical Hygiene Plan requires FME to evaluate local exhaust systems (CFH and special purpose hoods) every 6 months, or as needed after repairs or maintenance, and maintains a record of test results and ventilation system modifications.

2. Instruments using electrical, electronic, or mechanical components shall be calibrated in accordance to manufacturer's recommendations before use or after any possible damage (such as dropping the test meter.)

3. Emergency bypass dampers shall be tested by applying the appropriate control signal and observing the damper movement for the full range of designed operation.

4. Other dampers and associated drive linkage and actuators shall be inspected visually and the actuator operated enough to observe proper movement.

5. Air filter gauges shall be read and inspected at least annually. If the pressure differential exceeds the rated maximum, the filters shall be changed at the first opportunity.

6. Exhaust flow rate from hoods shall be tested by measuring the flow in the duct by the hood throat suction method or by a flow meter. If flow measurement in the duct is not practical, velocity at the hood face shall be measured. If the flow rate differs more than 10 % from design, corrective action shall be taken.

7. Fans, blowers, and drive mechanisms shall be visually inspected annually for abnormal noise, vibration, abnormal motor temperature, lubricant leaks, etc.

8. V-belt drives shall be stopped and inspected annually for belt tension and signs of wear or checking.

9. A routine performance test shall be conducted on every fume hood at least semi-annually or whenever a significant change has been made to the operational characteristics of the system. If face velocity is used, the face of the hood shall be divided into 12 or more imaginary rectangles of approximately equal area and velocity measured. Each hood shall maintain a face velocity of 100 fpm with a uniform face velocity profile of +/- 20% of the average velocity with the sash fully open.

XIII. RENOVATION/NEW CONSTRUCTION

Building HVAC systems shall be designed to provide a purge cycle during building start-up and when future renovations occur. The purge cycle employs 100% outdoor air to ventilate away vapors/gases and odors generated by construction materials, furnishing, and finishes. The A/E shall develop in the design phase a formal start-up and commissioning procedure that addresses indoor air quality requirements.

A. New Construction Off-gassing

In general, most new construction will result in the release (off-gassing) of materials that can affect occupant comfort. If hazardous substances are avoided in the construction, these materials will generally be nonhazardous; however, they can still have a detrimental effect on indoor air quality. Examples of nonhazardous substances that can affect indoor air quality include systems furniture, carpets, and paints.

1. New facilities shall be allowed to off-gas prior to occupancy. Ventilation systems on new construction shall be operated for an appropriate time before the area is occupied.

2. For renovations, where it is not feasible to isolate the NCI-Frederick employees from the off-gassing, materials which are going to off-gas and affect indoor air quality shall be allowed to air out and off-gas in a warehouse or well-ventilated, unoccupied area before they are installed. Note - Subcontractors shall provide the COTR with all MSDS for products which may off-gas materials. Copies shall be

forwarded to EHS.

3. Insecticidal dusts, such as boric acid, shall not be applied in wall void and/or chase areas as part of the facility construction or renovation.

B. Clearance for Renovation/Remodeling - Radiation Areas

The EHS Radiation & Environmental Protection Branch shall be notified prior to any renovation or remodeling in laboratories using radioactive material. The laboratory shall be surveyed by the Principal Investigator or authorized users, and the Radiation Safety Office will conduct additional confirmation or clearance surveys prior to release of the laboratory for unrestricted use, if necessary. Ventilation systems used for controlling airborne radioactive discharges require design considerations. Hoods used for bulking radioactive material shall have the capability for sampling. In addition, the design shall accommodate space in the mechanical room to provide for any future additional filtration capability.

If the facility requires additional hoods, specifically for the use of iodination techniques, then the exhaust from these installations shall be equipped with the capability for HEPA and charcoal filtration. The exhaust system of radio-iodination hoods must be entirely separate from other ventilation components.

XIV. RECORDS AND DOCUMENTATION

FME shall maintain relevant documentation for each laboratory ventilation system and component hoods. Records shall be maintained for all inspections and maintenance operations in addition to original design criteria.