

APPENDIX N

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LABORATORY HOODS, BIOLOGICAL SAFETY CABINETS, AND LAMINAR FLOW CABINETS

1. LOCATION

Locate hoods away from air turbulence, egress traffic, openable windows, doors, air supply grilles and heavy traffic aisles.

2. HOOD PERFORMANCE REQUIREMENTS

.1 All newly installed hoods must meet the modification of the ANSI/ASHRAE 110-1985 Standard (Method of Testing Performance of Laboratory Fume Hoods) before being accepted by the University. The modification of the Standard or the Caplan and Knutson method of hood performance, would require the sashes to be positioned half opened rather than fully open. Otherwise, the evaluation methodology remains the same. Performance test results must be forwarded to the Division of Environmental and Occupational Health and Safety (EOHS) for review and approval.

.2 Laboratory or chemical hoods shall be the "Bypass type", because of their good performance characteristics and minimal maintenance requirements.

.3 Chemical fume hoods, auxiliary hoods, canopy hoods, glove boxes, and horizontal flow (clean benches) are not to be permitted without careful review and approval by the Division of Environmental and Occupational Health and Safety. Performance and maintenance problems associated with these hood designs, necessitates this type of policy.

3. CONSTRUCTION FEATURES

.1 CEMENTITIOUS-BOARD-LINED LABORATORY HOOD

.1.1 The superstructure interior shall be fabricated of asbestos-free, acid-resistant, fiber-reinforced cement board at least 1/4-inch thick and manufactured for use in this application. Interior fasteners, brackets, and hinges shall be Type 304 stainless steel.

.1.2 Interior access panels shall be flush mounted to minimize eddy currents.

.1.3 Fluorescent light panel shall have a vapor-tight stainless steel frame.

.1.4 Vertical sliding sash shall have 1/4-inch thick laminated safety glass. Sash frame shall be 18-gauge stainless steel rolled shape,

3. CONSTRUCTION FEATURES (Cont'd)
 - .1 CEMENTITIOUS-BOARD-LINED LABORATORY HOOD (Cont'd)
 - .1.4 (Cont'd)

mitered, welded and ground smooth. Sash will run in polished stainless steel guides with nylon bushings and shall employ vinyl-coated over nylon ball-bearing pulleys. Coated steel counterweights shall be concealed in the superstructure.
 - .2 STAINLESS STEEL-LINED LABORATORY HOOD
 - .2.1 Use 18-gauge Type 304 stainless steel for interior and baffles except worktop, which is to be 16-gauge. Provide No. 4 finish.
 - .2.2 Exposed metal on the interior of the hood shall be stainless steel.
 - .2.3 Sash shall be similar to 3.1.4 above.
 - .3 RADIOACTIVE ISOTOPE OR CARCINOGEN LABORATORY HOOD
 - .3.1 Use 18-gauge Type 316 seamless steel for interior and baffles except worktop, which is to be 16-gauge. Polish to No. 4 finish. Provide an integral trough in the worktop and cove corners which have 1/2-inch radius.
 - .3.2 Exposed metal on the interior of the hood shall be stainless steel.
 - .3.3 Equip each hood with an absolute filter housing to accommodate prefilter (15 percent ASHRAE) and high efficiency filter (HEPA 99.97 DOP). Provide a gauge to monitor pressure drop across filter.
 - .3.4 Sash shall be similar to 3.1.4 above.
 - .3.5 Comply with the Nuclear Regulatory Commission (NRC) standards (Codes 10CFR19 and 190CFR20).
 - .4 PERCHLORIC ACID LABORATORY HOOD
 - .4.1 Same as .3.3.1, .2, .4 above. Provide stainless steel sink.
 - .4.2 Baffles are to be removable.
 - .4.3 Provide spray-type washdown system which will wash surfaces behind baffles. Arrange sash to prevent leakage of washdown water from the hood.
 - .4.4 Provide a blow-out panel with two (2) stainless steel arresting devices and stainless steel control cables.

3. CONSTRUCTION FEATURES (Cont'd)
 - .4 PERCHLORIC ACID LABORATORY HOOD (Cont'd)
 - .4.5 Provide for easy visual inspection of hidden surfaces.
 - .4.6 Use no organic coatings, lubricants or sealants.
 - .4.7 Comply with latest edition of the American Conference of Governmental Industrial Hygienists (ACGIH) Industrial Ventilation Manual.
 - .5 EXPLOSION-PROOF LABORATORY HOOD
 - .5.1 Same construction as hoods above except for the following:
 - .5.2 Provide a blow-out panel in lieu of an automatic air bypass. Blow-out panel must have an arresting device.
 - .5.3 Any device in the air stream shall be non-sparking and explosion-proof.
4. EXHAUST SYSTEMS
 - .1 AIR SUPPLY
 - .1.1 Standard hoods, whose volume and velocity of exhaust varies with the sash opening, create air balance problems in building systems. If used, provide for the variables. Remember that building air balance method must conform to hood manufacturer's recommendations.
 - .1.2 Constant volume hoods with an internal bypass permit balancing air supply and exhaust and may serve as air change exhaust for laboratories. Holiday, night or weekend shut down for energy conservation may create serious problems if someone tries to use a hood during the shut down period.
 - .1.3 Auxiliary air supply can reduce operating costs by using slightly tempered or untempered outdoor air or drawing from exhaust air sources to save heating or cooling air in excess or code air change requirements. Locating and grouping loads in special rooms may be desirable.
 - .1.4 Outside air intake shall be located to avoid recapture of exhaust air.
 - .2 EXHAUST
 - .2.1 Velocity - minimum duct velocity to be 2000 fpm.

4. EXHAUST SYSTEMS (Cont'd)

.2 EXHAUST (Cont'd)

- .2.2 No entire floor of a building shall depend upon one fan to serve all hoods and cabinets unless only one hood or cabinet is served on that floor.
- .2.3 Duct discharge velocity to be 3000 fpm minimum.
- .2.4 Rooms where hoods are located should have a room air change of at least 10 to 20 per hour and be kept under slight negative pressure in relation to adjacent spaces in order to control fugitive airborne chemicals from escaping.

.3 CONSTRUCTION

- .3.1 Materials shall be non-combustible. Suggested materials are: Radioisotope, bacteriological or perchloric acid -- stainless steel. General chemical exhaust -- carbon steel sandblasted and coated with epoxy or coated with a phenolic.
- .3.2 Fans shall be above the roof and readily accessible for maintenance. Lubricate fan for perchloric system with fluorocarbon-type grease.
- .3.3 Ducts shall exhaust upward, have an all weather cap, "China Caps" are not permitted on exhaust stacks. The exhaust stacks or ducts should be at least 8-feet higher than building elements within 33-feet, including any door, window, intake grille or occupied space. Exhaust should extend at least seven (7) to ten (10) duct diameters from the fan in order to reduce the "systems effect" that will result in increased static pressure.
- .3.4 Fire dampers are prohibited in exhaust ducts.
- .3.5 An interlocking arrangement to shut off duct fan, if supply air fails, is prohibited.
- .3.6 Fire detectors and alarm devices shall not automatically shut off fans except as required when actuating a halon or carbon dioxide extinguishing system.
- .3.7 Horizontal duct runs serving any one hood, safety cabinet, or equal shall be limited to 33-feet or four 90-degree bends or equivalent.
- .3.8 Each hood for perchloric acid must have should be entirely vertical, but one bend is permitted. Provide a wash-down system for the duct from and hood.

5. STANDARDS AND CODES

A partial list of applicable standards and codes includes:

NFPA 45-2004, Chapter 6 - Standard on fire protection for laboratories using chemicals.

NFPA 70-2005 - National Electrical Code.

NFPA 90A-2002 - Standard for the installation of air conditioning and ventilating systems.

NFPA 801-2003, Chapter 5 - Recommended fire protection practice for facilities handling radioactive materials.

NFPA 91-2004 - Standard for the installation of blower and exhaust systems.

NSF-49 - Standard for Class II (Laminar Flow) biohazard cabinetry.

NFPA = NFPA = National Fire Protection Association, Quincy, MA.

NSF = The National Sanitation Foundation, Ann Arbor, MI.

END OF APPENDIX N