

SECTION 11 53 13
LABORATORY FUME HOODS

SPEC WRITER NOTE: Delete between // // if not applicable to project. Delete other items or paragraphs in the section that are not applicable and renumber the paragraphs. Note VA does not permit the use of Auxiliary-Air Hoods.

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section includes chemical (general-purpose) hoods, radioisotope hoods, and perchloric acid hoods.

1.2 DEFINITIONS

A. Chemical or General-Purpose Hoods

1. AUXILIARY-AIR HOOD: A hood with a dedicated duct that supplies up to 50% outside air to the face of the hood. Use of this type of hood is not permitted.
2. BYPASS HOOD: A hood that contains openings above the sash and below the airfoil, which redistribute the air to reduce fluctuations in face velocity and turbulence within the hood, when the sash is re-positioned.
3. 100% RE-CIRCULATORY (DUCTLESS) FUME HOODS: A ductless, self-contained, carbon and/or HEPA-filtered enclosure, that draws air into the front of the hood, passes it through multi-stage filters, and then re-circulates it into the lab. These hoods can be placed onto fixed work surfaces or on mobile stands.
4. LOW-VELOCITY HOOD: A high-performance hood that yields energy savings by reducing the sash opening and the corresponding exhaust volume, while maintaining safe containment levels with the sash raised for set-up and face velocity as low as 0.30 m/s (60 fpm).

B. RADIOISOTOPE HOOD: A hood that is used for radioactive applications, with a stainless steel liner and an integral work surface.

C. PERCHLORIC ACID HOOD: A hood that is dedicated for use with perchloric acid only, due to the potential reaction of the acid with other chemicals. The hood, duct and fan must have a water wash-down system for removal of perchlorate crystals (salts) after use.

1.3 RELATED WORK

- A. Section 11 05 12 General Motor Requirements for Equipment: Integral fans on hoods.

- B. Section 12 31 00, MANUFACTURED METAL CASEWORK; Section 12 32 00, MANUFACTURED WOOD CASEWORK; Section 12 34 00, MANUFACTURED PLASTIC CASEWORK for cabinetry below laboratory fume hoods.
- C. Section 22 15 00, GENERAL SERVICE COMPRESSED-AIR SYSTEMS: Connections to compressed air system.
- D. Section 22 11 00, FACILITY WATER DISTRIBUTION: Plumbing connections.
- E. Section 22 13 00, FACILITY SANITARY AND VENT PIPING: Plumbing connections.
- F. Section 22 66 00, CHEMICAL-WASTE SYSTEMS FOR LABORATORY and HEALTHCARE FACILITIES: Plumbing connections.
- G. Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY and HEALTHCARE FACILITIES: Connections to gas and vacuum systems.
- H. Section 22 63 00, GAS SYSTEMS FOR LABORATORY and HEALTHCARE FACILITIES: Connections to gas and vacuum systems.
- I. Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- J. Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC: Face velocity sensor controller.
- K. Section 23 31 00, HVAC Ducts and Casings: Exhaust and makeup air ductwork.
- L. Section 23 34 00, HVAC FANS.
- M. Section 23 36 00, AIR TERMINAL UNITS: Airflow control valves.
- N. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Electrical connections.
- O. Section 26 27 26, WIRING DEVICES: Electrical devices.
- P. Section 26 29 11, MOTOR CONTROLLERS: Motor controllers.

1.4 PERFORMANCE REQUIREMENTS

- A. Average Face Velocity for general chemical and ductless laboratory fume hoods: 0.51 m/s (100 fpm) with sash located at the average sash stop of 457 mm (18 inches).
- B. Average face velocity for low velocity laboratory fume hoods can be as low as 0.3 m/s (60 fpm) with sash located at the average low velocity hood sash stop height of 304 to 457 mm (12 to 18 inches).
- C. Containment: Furnish and install laboratory fume hoods that are tested according to ASHRAE 110 at a release rate of 4.0 L/min (0.14 CFM).
 - 1. Face Velocity Variation: Allowable variation threshold is not more than $\pm 10\%$ of average face velocity.

SPEC WRITER NOTE: Size hood exhaust system for sash in the fully open

position for the specified static pressure losses.

2. Sash Position:

- a. For horizontal-sash units, test with maximum opening on side, with maximum opening in the center, and with opening at each side equal to half of maximum opening.
- b. For combination-sash units, test with sash fully raised, with maximum opening on side, with maximum opening in the center, and with opening at each side equal to half of maximum opening.
- c. For vertical sash units, test with sash fully open, and at typical sash stop height of 457 mm (18 inches).

SPEC WRITER NOTE: Options for AM and AI rating requirements included below are examples only; verify requirements for project.

3. As-Manufactured (AM) Rating: AM // 0.05 mg/L (0.05 ppm) // // //.

4. As-Installed (AI) Rating: AI // 0.05 mg/L (0.05 ppm) // // //.

D. Average Static-Pressure Loss: Not more than 93 Pa (3/8-inch wc) at 0.51 m/s (100 fpm) face velocity when tested according to SEFA 1.2.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Manufacturer with a minimum of three (3) years' experience in providing items of types specified. Submit manufacturer's qualifications.
- B. Installer's Qualifications: Installers who have with a minimum of three (3) years' experience in the installation of units required for this project. Submit installer qualifications.
- C. Digital electronics devices, software and systems to be the current generation of technology that has a proven satisfactory service record of at least three (3) years.

1.6 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data: Include the following:
 1. Illustrations and descriptions of laboratory fume hoods and factory-installed devices for fume hoods.
 2. Catalog or model numbers for each item incorporated into the work.
 3. Static-pressure losses and exhaust volumes for fume hoods.
 4. Results of testing according to ASHRAE 110.

- C. Shop Drawings: Show details of fabrication, installation, adjoining construction, coordination with mechanical and electrical work, anchorage, and other work required for complete installation.
- D. Field Test Reports: Indicate dates and times of tests and certify test results.
- E. Factory Test Reports: Provide manufacturer's QC checklist or other reports that indicate comprehensive factory testing has been performed, and the results of these tests have been certified.
- F. Operating Instructions: Comply with requirements in Section 01 00 00, GENERAL REQUIREMENTS.
- G. Manufacturer's qualifications.
- H. Installer's qualifications.
- I. Manufacturer's warranty.

1.7 WARRANTY

- A. Construction Warranty: Comply with FAR clause 52.246-21, "Warranty of Construction".
- B. Manufacturer Warranty: Manufacturer shall warranty their laboratory fume hoods for a minimum of two (2) // // years from date of installation and final acceptance by the Government. Submit manufacturer warranty.

1.8 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American National Standards Institute / American Society of Heating, Refrigerating and Air-Conditioning Engineers (ANSI/ASHRAE):
110-2016.....Method of Testing Performance of Laboratory
Fume Hoods
- C. Scientific Equipment and Furniture Association (SEFA):
1-05.....Recommended Practices for Laboratory Fume Hoods
2-10.....Recommended Practices for Installation
- D. National Fire Protection Association (NFPA):
45-2011.....Standard on Fire Protection for Laboratories
using Chemicals

PART 2 - PRODUCTS

2.1 FUME HOODS, GENERAL

- A. Furnish and install laboratory fume hoods that comply with recommendations in SEFA 1.

SPEC WRITER NOTE: Show types, quantities, and locations of service fixtures required for each type of fume hood on drawings.

- B. Factory install service fixtures and electrical devices as shown on the construction documents.
- C. Ductwork: All ductwork shall be stainless steel. Refer to Section 23 31 00, HVAC DUCTS and CASINGS.
- D. Face Velocity Controller (VAV Fume hoods): Provide fume hood exhaust controllers to control a damper in the hood discharge to maintain the velocity through the open face of the hood regardless of sash position. Refer to Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC.
- E. Gas, Air, and Vacuum Service Fixtures: Remote controlled; with valve identified by index button; with serrated tip outlets; color-code valves and outlets. Refer to Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY and HEALTHCARE FACILITIES and Section 22 63 00, GAS SYSTEMS FOR LABORATORY and HEALTHCARE FACILITIES.
- F. Water Service Fixtures: Remote controlled, with integral vacuum breaker and as follows:
1. // Turret // // 152.4 mm (6 inch) swivel gooseneck // // Turret and 152.4 mm (6 inch) swivel gooseneck // outlet.
 2. // PVC // // Epoxy-coated brass //.
 3. Refer to Section 22 11 00 FACILITY WATER DISTRIBUTION.
- G. Service-Fixture Color-Coding: Color-code service fixtures as follows:

Service	Color
Water	Dark Green
Air	Orange
Gas	Dark Blue
Vacuum	Yellow

SPEC WRITER NOTES:

1. The wiring of the hood light and any electrical devices (switches, receptacles, etc.) needs to be shown on the electrical drawings per NEC requirements.
2. Verify availability of LED lighting before specifying.

- H. Lighting Fixtures:

1. Vapor proof Fixtures: 120-V // incandescent // // two (2) tube fluorescent// // LED //.

SPEC WRITER NOTE: Include the paragraph below where explosion-proof hoods are required and specifically identify explosion-proof type hoods on the drawings. These types of hoods are not typically used and their application requires close coordination with the associated electrical requirements and exhaust fan.

2. Explosion-Proof Fixtures: 120-V // incandescent // // 2-tube fluorescent // // LED //. Fixtures shall be shipped loose for field wiring and installation.

SPEC WRITER NOTE: Edit the paragraph below for project specific needs.

- I. Receptacles and Switches: Include junction box and cover plate. Refer to Section 26 27 26, WIRING DEVICES.

1. Duplex Receptacles: 120 V, single phase, // 15 A // // 20 A //, 2-pole, 3-wire.
2. Single Receptacles: 250 V, single phase, // 15 A // // 20 A //, 2-pole, 3-wire.

SPEC WRITER NOTE: Provide GFI if a sink is within (6 feet) of the receptacle per NEC.

3. // Ground Fault Interrupter (GFI) Duplex Receptacles: Integral unit with 2-pole, 3-wire, 120-V, 20-A receptacle. //
4. Lighting Fixture Switches: Toggle, single pole, 120-277 V, 20 A.
5. Switches with Receptacles: Single-pole switch to control lighting fixtures and 120-V, 15-A, 2-pole, 3-wire single receptacle.
6. Switches with Neon Pilots: Single-pole toggle turns on pilot light, which indicates switch and load are "on"; 120 V, 15 A.
7. Motor Controller Switches: Double-pole switch with pilot light and thermal-overload protection. Refer to Section 26 29 11, MOTOR CONTROLLERS.

- J. Airflow Monitor: With audible alarm and warning light. Provide digital type unit with alarm contacts to allow connection to the DDC control system to facilitate remote monitoring. Refer to Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC.

- K. Airflow Control Valve (VAV Hoods): Refer to Section 23 36 00, AIR TERMINAL UNITS.

SPEC WRITER NOTES:

1. For fume hood exteriors, SEFA 1 requires materials resistant to chemical fumes and exposures encountered in the laboratory; therefore, it allows the use of epoxy-coated metal.
2. If a specific exterior material is required, insert requirements in articles below description of fume hoods.
3. Match liner and work surface to type of hood, chemicals, and the work that will be performed in the hood.

2.2 BYPASS FUME HOODS

- A. Airflow Systems: Bypass. Hoods served by variable air volume exhaust systems to include a, factory install bypass block to restrict the bypass of air and allow reduction of the exhaust air volume as the sash is lowered while maintaining a constant face velocity.
- B. Liners: // Polyester resin // // Stainless Steel Type 304, No. 4 // finish.
- C. Work Surfaces: Epoxy resin.
- D. Sinks: Epoxy resin.
 1. Cup Sinks: Equip with Diametre Nominal (DN) 40 (Nominal Pipe Size (NPS) 1-1/2 inch) tailpiece, sink stopper, and P trap.
 2. Laboratory Sinks: Equip with DN 40 (NPS 1-1/2 inch) sink outlet, sink stopper, beehive overflow, and P trap.
- E. Lighting Fixtures: // Vapor proof // // Explosion-proof where specifically indicated on the construction documents //.
- F. Blowers: Remote; sized to create exhaust air volume that produces average face velocity indicated with sashes fully open. Blowers to be constructed with chemical-resistant coating. Refer to Section 23 34 00, HVAC FANS.
- G. Sashes: // Vertical // // Horizontal // // Combination // type; fully tempered safety glass.
 1. Accessories: Sash stops, commonly installed 457 mm (18 inches).
- H. Bases: // Table // // Cabinet //. Refer to Section 12 31 00, MANUFACTURED METAL CASEWORK; Section 12 32 00, MANUFACTURED WOOD CASEWORK; Section 12 34 00, MANUFACTURED PLASTIC CASEWORK.

2.3 RADIOISOTOPE FUME HOODS

- A. Airflow Systems: Bypass

- B. Liners and Work Surfaces: Stainless steel, Type 304, No. 4 finish; seamless construction; and with integral dished work surface.
- C. Lighting Fixtures: Vapor proof.

SPEC WRITER NOTES:

1. The designer to coordinate the need to install filters in the exhaust air stream with the end-users and VA Radiology Safety Officer.
2. Based on the number and type of isotopes, the exhaust air stream may require: a. HEPA (99.97% efficiency at 0.3 Microns), b. HEPA and Active Charcoal Filters, or No Filters in the exhaust air prior to its discharge outdoors.
3. Radioisotope hoods require HEPA filters. Where requested by the Medical Center, carbon type to also be provided.
4. Due to the nature of the material conveyed, bag-in/bag-out type are required for all filters.

- D. Filters: // HEPA // // Carbon // Type; with bag in and bag out housings.
- E. Blowers: Remote; sized to create exhaust air volume that produces average face velocity indicated with sashes at the sash stop 457 mm (18 inches) open. Blowers to be constructed with chemical chemical-resistant coating. Refer to Section 23 34 00, HVAC FANS.
- F. Sashes: Vertical Type; fully tempered safety glass.
1. Accessories: Sash stops, commonly installed at 457 mm (18 inches).
- G. Bases: // Table // // Cabinet //. Refer to Section 12 31 00, MANUFACTURED METAL CASEWORK; Section 12 32 00, MANUFACTURED WOOD CASEWORK; Section 12 34 00, MANUFACTURED PLASTIC CASEWORK.

2.4 PERCHLORIC-ACID FUME HOODS

- A. Airflow Systems: Bypass
- B. Liners and Work Surfaces: // Stainless steel, Type 316, No. 4 // // PVC // finish; seamless construction; and with integral dished work surface and full-width drainage trough at back face of work surface.
1. Drainage Trough: Equip with DN 40 (NPS 1-1/2) tailpiece and with P trap.
- C. Lighting Fixtures: Vapor proof
- D. Blowers: Remote; Spark and corrosion-resistant, sized to create exhaust air volume that produces average face velocity of 0.64 m/s (125 fpm)

with sashes at the sash stop 457 mm (18 inches) open; constructed of chemical-resistant PVC. Locate motor out of the air stream.

- E. Wash-Down System: Required for exhaust ductwork, blower, and hood structure. The system within the hood structure to be integral to the hoods with provisions for connecting the piping to the nozzles in the duct and blower. The nozzles/wash rings to be provided by the hood manufacturer. Wash rings are required at every change in direction and every 2.43 to 3.05 meters (8 to 10 feet) in the exhaust duct system. Provide drain for exhaust blower. Refer to Section 22 11 00, FACILITY WATER DISTRIBUTION for plumbing connections.
- F. Sashes: Vertical. Combination type, fully tempered safety glass.
 - 1. Accessories: Sash stops, commonly installed at 457 mm (18 inches).
- G. Bases: // Table // // Cabinet //. Refer to Section 12 31 00, MANUFACTURED METAL CASEWORK; Section 12 32 00, MANUFACTURED WOOD CASEWORK; Section 12 34 00, MANUFACTURED PLASTIC CASEWORK.
- H. Ductwork: Welded 316 stainless steel; use of flexible duct is not permitted; Manifold with any other exhaust ductwork is not permitted. Provide with minimum horizontal runs.

SPEC WRITER NOTE: A Low Velocity Hood maintains safe containment levels with face velocity as low as 0.3 m/s (60 fpm).

2.5 LOW VELOCITY FUME HOODS

- A. Airflow Systems: Restricted Bypass. For hoods served by variable air volume exhaust systems, provide a factory installed bypass block to further restrict the bypass and allow reduction of the exhaust air volume as the sash is lowered while maintaining a constant face velocity.
- B. Liners: // Stainless steel, Type 304, // // Polyresin // finish.
- C. Work Surfaces: Epoxy
 - 1. Cup Sinks: Equip with DN 40 (NPS 1-1/2) tailpieces, sink stoppers, and P traps.
- D. Lighting Fixtures: // Vapor-proof // // Explosion-proof where specifically indicated on the construction documents //.
- E. Blowers: Remote; sized to create exhaust air volume that produces average face velocity indicated with sashes fully open (sized at the reduced average face velocity the hood is rated for). Blowers to be constructed with chemical chemical-resistant coating. Refer to Section 23 34 00 HVAC FANS.

F. Sashes: // Vertical // // Horizontal // // Combination // Type; fully tempered safety glass

1. Accessories: Sash stops, commonly installed at 457 mm (18 inches).

G. Bases: // Table // // Cabinet //. Refer to Section 12 31 00, MANUFACTURED METAL CASEWORK; Section 12 32 00, MANUFACTURED WOOD CASEWORK; Section 12 34 00, MANUFACTURED PLASTIC CASEWORK.

2.6 100% RE-CIRCULATORY FUME HOODS

A. Airflow Systems: Bypass

B. Liners: // Acrylic // // Type 304 Stainless Steel // finish.

C. Work Surfaces: // Type 304 Stainless Steel // // Fiberglass // // Epoxy // finish.

SPEC WRITER NOTE: Match the number and types of filters to the chemicals that are being used inside the hood.

D. Filters: Multi-Stage, // HEPA // // Charcoal //.

E. Lighting Fixtures: Vapor proof.

F. Blowers: Built-in; sized to create exhaust air volume that produces average face velocity indicated with sashes fully open.

G. Sashes: Vertical, fully tempered safety glass.

1. Accessories: Sash stops, commonly installed at 457 mm (18 inches).

H. Bases: // Table // // Mobile Cart //. Refer to Section 12 31 00, MANUFACTURED METAL CASEWORK; Section 12 32 00, MANUFACTURED WOOD CASEWORK; Section 12 34 00, MANUFACTURED PLASTIC CASEWORK.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install laboratory fume hoods to comply with SEFA 2.

B. Locate unit away from fans, heating and air conditioning registers, laboratory hoods, high traffic areas and doors that could interfere with airflow patterns.

3.2 TEST

A. Field test installed laboratory fume hoods according to ASHRAE 110 to verify compliance with performance requirements for containment.

1. For units that fail testing, make adjustments and corrections to installation, or replace fume hoods, and repeat tests until fume hoods comply with requirements.

3.3 PROTECTING AND CLEANING

A. Protect equipment from dirt, water, and chemical or mechanical injury during the remainder of the construction period.

- B. At the completion of work, clean equipment as required to prepare for use.

3.4 INSTRUCTIONS

- A. Instruct personnel and transmit operating instructions in accordance with requirements in Section 01 00 00, GENERAL REQUIREMENTS. Training must be provided by Manufacturer or Installer.

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