

SECTION 11610
LABORATORY FUME HOODS
SafeAire II

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Laboratory fume hoods.
- B. Related Sections:
1. Section 12345 - [Modular Steel Laboratory Casework] [Legacy Oak Laboratory Casework] [Plastic Laminate Casework]: Base unit [and working surface] for fume hood/base unit assembly.
 2. Section 12346 - [C-Frame] [Multi-flex] [MAX/LAB] Laboratory Furniture System.
 3. Section _____ - _____: Furnishing and installation of plumbing utilities and final connections to fume hoods.
 4. Section _____ - _____: Furnishing and installation of exhaust duct work and equipment, and final connection of fume hoods.
 5. Section _____ - _____: Furnishing and installation of electrical utilities and final connections to fume hoods.

1.02 FUME HOOD GENERAL DESIGN REQUIREMENTS

- A. Fume hoods shall function as ventilated, enclosed workspaces, designed to capture, confine and exhaust fumes, vapors and particulate matter produced or generated within the enclosure.
- B. Design fume hoods for consistent and safe air flow through the hood face. Negative variations of face velocity shall not exceed 20% of the average face velocity at any designated measuring point as defined in this section.
- C. Average illumination of work area: Minimum 80 footcandles. Work area shall be defined as the area inside the superstructure from side to side and from face of baffle to the inside face of the sash, and from the working surface to a height of 28 inches.

- D. Fume hood shall be designed to minimize static pressure loss with adequate slot area and bell shaped exhaust collar configuration. Maximum average static pressure loss readings taken three diameters above the hood outlet from four points, 90 degrees apart, shall not exceed the following maximums with sash in full open position:

Face Velocity	Measured S.P.L. (W.G.)
75 F.P.M.	.18 inches
100 F.P.M.	.30 inches
125 F.P.M.	.45 inches
150 F.P.M.	.60 inches

- E. Fume hood shall maintain essentially constant exhaust volume at any baffle position for safety. Maximum variation in exhaust CFM, static pressure and average face velocity as a result of baffle adjustment shall not exceed 5% for any baffle position at the specified face velocity.
- F. Fume hoods shall be field convertible, from bypass type to auxiliary air by simple component replacement or addition. Change-over shall be accomplished without construction modifications and without special tools.
- G. Noise Criteria: Test data of octave band analysis verifying hood is capable of a 50 NC value when connected to a 50 NC HVAC source. Reading taken 3' in front of open sash at 100 fpm face velocity.

1.03 LINER SURFACE FINISH PERFORMANCE REQUIREMENTS

At specifier's option, insert here applicable performance requirements for type E, R, P, S, Y or C liners from Appendix F.1, F.2, F.3, F.4, F.5 or F.6 respectively.

1.04 SUBMITTALS

Include number of each type of submittal required if this information is not covered in Division 1 or elsewhere.

- A. Shop Drawings: Indicate equipment locations, large scale plans, elevations, cross sections, rough-in and anchor placement dimensions and tolerances and all required clearances.
- B. Product Data: Submit manufacturer's data for each component and item of laboratory equipment specified. Include component dimensions, configurations, construction details, joint details, and attachments, utility and service requirements and locations.
- C. Samples: Submit [3 x 6] [x] inch samples of finish for fume hood, work surfaces and for other pre-finished equipment and accessories for selection by [Architect] [Owner].
- D. Test Reports: Submit test reports on **each size and type of hood** verifying conformance to test performances specified. Test report must accompany **each** hood as part of installation and usage package. Submit independent test reports as required by specification.
- E. Instructions: Submit for review and approval
 - 1. Instructions to be inscribed on instruction plate to be attached to hood, as specified in Part 2 of this Section.
 - 2. Written instructions in booklet form providing additional details on safe and proper operation and maintenance.
 - 3. Professional quality video - minimum 15 minutes in length on proper hood usage.

1.05 QUALITY ASSURANCE

- A. Single source responsibility: Fume hood casework, work surfaces, and other laboratory equipment and accessories shall be manufactured or furnished by a single laboratory furniture company.
- B. Manufacturer's qualifications: Modern plant with proper tools, dies, fixtures and skilled workmen to produce high quality laboratory casework and equipment, and shall meet the following minimum requirements:
 - 1. Five years or more experience in manufacture of laboratory casework and equipment of type specified.
 - 2. Ten installations of equal or larger size and requirements.

3. UL 1805 Specification:
Fume Hood must be Underwriters Laboratories subject 1805 classified. The 1805 standard covers electrical and mechanical hazards, investigates the flammability of materials and measures the effectiveness of airflow characteristics. Proper labeling must be affixed to the face of each fume hood indicating classification to the UL 1805 standard for Laboratory Fume Hoods. UL listing covering electrical components only or other listings that do not encompass all issues covered in UL 1805 is insufficient. All factory testing shall be performed in a U.L. certified test facility.

- C. Installer's qualifications: Factory certified by the manufacturer.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Schedule delivery of equipment so that spaces are sufficiently complete that equipment can be installed immediately following delivery.
- B. Protect finished surfaces from soiling or damage during handling and installation. Keep covered with polyethylene film or other protective coating.
- C. Protect all work surfaces throughout construction period with 1/4" corrugated cardboard completely covering the top and securely taped to edges. Mark cardboard in large lettering "No Standing".

1.07 PROJECT CONDITIONS

- A. Do not deliver or install equipment until the following conditions have been met:
 1. Windows and doors are installed and the building is secure and weather tight.
 2. Ceiling, overhead ductwork and lighting are installed.
 3. All painting is completed and floor tile located below casework is installed.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Casework and equipment manufacturer: Fisher Hamilton L.L.C., 1316-18th Street, Two Rivers, Wisconsin 54241.

2.02 FUME HOOD MATERIALS

- A. Steel: High quality, cold rolled, mild steel meeting requirements of ASTM A366; gauges U.S. Standard and galvanized.
- B. Stainless steel: Type 304; gauges U.S. Standard.
- C. Ceiling closure panels: Minimum 18 gauge; finish to match hood exterior.
- D. Bypass grilles: Low resistant type, 18 gauge steel, upward directional louvers.
- E. Safety glass: 7/32" thick laminated safety glass.
- F. Sash cables: Stainless steel, uncoated, 1/8" diameter military spec. quality. (MIL-W-83420D-3)
- G. Sash guides: Corrosion resistant poly-vinyl chloride.
- H. Pulley assembly for sash cable: 2" diameter, zinc dichromate finish, ball bearing type, with cable retaining device. (Nylon tired-not acceptable.)
- I. Sash pull: Full width corrosion resistant plastic, stainless steel or steel with chemical resistant powder coating.
- J. Gaskets: 70 durometer PVC for interior access panels. Gasket interior access panels to eliminate air leakage and to retain liquids inside hood.
- K. Fastenings:
 - 1. Exterior structural members attachments: Sheet metal screws, zinc plated.
 - 2. Interior fastening devices concealed. Exposed screws not acceptable. (Screw head "caps" not acceptable.)

3. Exterior panel member fastening devices to be corrosion resistant, non-metallic material. Exposed screws not acceptable.
- L. Instruction plate: Corrosion resistant or plastic plate attached to the fume hood exterior with condensed information covering recommended locations for apparatus and accessories, baffle settings and use of sash.

2.03 FUME HOOD CONSTRUCTION

- A. Superstructure: Rigid, self supporting assembly of double wall construction, maximum 4-7/8" thick.
1. Wall consists of a sheet steel outer shell and a corrosion resistant inner liner, and houses and conceals steel framing members, attaching brackets and remote operating service fixture mechanisms and services. Panels must be attached to a full frame construction, minimum 14 gauge galvanized members. Panels and brackets attached to eliminate screw heads and metallic bracketry from hood interior.
 2. Access to fixture valves concealed in wall provided by exterior removable access panels, gasketed access panels on the inside liner walls, or through removable front posts.
- B. Exhaust outlet: Rectangular with ends radiused, shaped and flanged, 18 gauge [steel finished with Chameleon powder coating] [stainless steel exhaust collars welded in place].

Provide stainless steel outlet with stainless steel liners.

- C. Access opening perimeter: Air foil or streamlined shape with all right angle corners radiused or angled. Bottom horizontal foil shall provide nominal one inch bypass when sash is in the closed position and relatively flush with the top of the work surface. Bottom foil shall be removable without use of special tools. Bottom foil shall provide access areas for electrical cords. Bottom foil: Steel with urethane powder coating I to increase acid and abrasion resistance.

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- D. Fume hood sash: Full view type with clear, unobstructed, side-to-side view of fume hood interior and service fixture connections.
1. Bottom sash rail: 2" maximum, 18 gauge steel with urethane powder coat finish. Provide integral formed, flush pull the full width of bottom rail.
 2. Set safety glass into rails in deep form, extruded poly-vinyl chloride glazing channels.
 3. Counter balance system: Single weight, pulley, cable, counter balance system which prevents sash tilting and permits one finger operation at any point along full width pull. Maximum 7 pounds pull required to raise or lower sash throughout its full length of travel. Design system to hold sash at any position without creep and to prevent sash drop in the event of cable failure. Life cycle test 100 pound sash and weight to 100,000 cycles without sign of failure. Provide independent test data.
 4. Postless sash design: Per drawing details.
 5. Open and close sash against rubber bumper stops.

Select one of the five following liner materials. Liner materials are applicable to various types fume hoods as follows:

Restricted Bypass: Types R, P, E, S, C, Y

Constant Volume/Bypass: Types R, P, E, S, C, Y Y

Perchloric: Type K

Radioisotope: Type K

- E. Fume hood liner: Resisto-Roc (product number denoted by the suffix "R"): Nominal 1/4" thick, dense, light gray monolithic sheet of chemically resistant, inorganic non-asbestos mixture of fiber cement. Liner shall have a "O" flame spread per ASTM E84 and longitudinal M.O.R. of 5,511 psi.
- E. Fume hood liner: Poly-resin (product number denoted by the suffix "P"): Reinforced polyester panel; smooth finish and white color in final appearance. Flexural strength: 14,000 psi. Flame spread: 25 or less per U.L. 723 and ASTM E84-80.

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- E. Fume hood liner: Resisto-Roc panel coated with chemically resistant enamel finish, off-white in color (product number denoted by the suffix "E"). Finish shall be chemical fume and splash resistant. Allow prime coat to dry; sand and wipe prior to application of finish coat.
- E. Fume hood liner: Stainless steel (product number denoted by the suffix "S"): 16 gauge, Type 304 stainless steel, with 2B finish. Work surfaces shall be dished stainless steel, caulked to sides and back.
- E. Fume hood liner: Seamless stainless steel (product number denoted by the suffix "K"): 16 gauge type 304 stainless steel, #4 grind, with seamless interior, fully coved and furnished without access panels.
- E. Fume hood liner: White polypropylene (product number denoted by the suffix "Y"): ¼" monolithic sheet of inorganic non-asbestos mixture of fiber cement. Panel skinned on exposed side with polypropylene laminate, white in color.
- E. Fume hood liner: PVC (product number denoted by the suffix "C"): ¼" thick polyvinyl chloride material, white in color, with a flame spread of 25 or less when tested to ASTM E84-80.
- F. Baffles: Baffles providing controlled air vectors into and through the fume hood must be fabricated of the same material as the liner. Provide exhaust slots full height on vertical sides of the baffle with upper slots adjustable. All baffle supports/brackets to be non-metallic.

Select one of the two following baffle designs.

- G. Multi-position fixed baffle: Slotted non-metallic baffle supports allow upper baffle panel to be repositioned prior to hood operation permitting setting for (1) high thermal loading and (2) normal or average operation.
 1. Provide acid resistant label indicating proper baffle operation. Locate label on sidewall of hood interior next to slotted baffle support.
 2. Baffle designs which permit close-off of all slots are not acceptable.
 3. Must comply with OSHA Lab Standard Guidelines. (Easily reached/adjusted with only arm in hood.)
 4. Non-adjustable baffles and baffles that require the use of tools for adjustment or repositioning are unacceptable.

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5. Baffle designs with metallic supports or fasteners not acceptable.
- G. Remote baffle adjustment: Toggle style, one handed, single point control, accomplished while hood is in use, without disturbing apparatus, from outside right hand corner post of fume hood with sash in either the open or closed position, and permitting setting for (1) high thermal loading and (2) normal or average operation.
1. Remote adjuster: Toggle style control handle and an acid resistant label indicating proper control handle location for baffle function.
 2. Rigidly correlate control handles to baffle positioner; cable-type adjustments are not acceptable
 3. Design baffle adjuster to engage and disengage from the adjustable baffle without the use of tools.
 4. Must comply with OSHA Lab Standard Guidelines. (Easily reached/adjusted with only arm in hood.)
 5. Baffles providing no adjustment or requiring internal manipulations are not acceptable.
 6. Non-metallic supports and fasteners required inside of hood.
- H. Service fixtures and fittings: Color coded washers at hose nozzle outlets and valves mounted inside the fume hood and controlled from the exterior with color coded index handles.
1. Valves: Needle point type with self-centering cone tip and seat of hardened stainless steel. Tip and seat shall be removable and replaceable.
 2. Provide piping for all service fixtures from valve to outlet: Galvanized iron or copper for water, air and vacuum and black iron for gas services.
 3. Fixtures exposed to hood interior: Brass with chemically resistant black powder coating.
 4. Remote control handles: Black nylon four-arm handle with nylon color-coded index buttons.
 5. Services: As shown or specified.

H. Service fixtures and fittings:
[Specified's Option]

1. Service treatment: Fittings are to be coated with a chemically resistant polyester powder lacquer electrostatically applied and backed on for a uniform finish.
2. Handle and outlet nozzle will be color coded to the media, with the same polyester powder lacquer finish. Handles shall be metal with media identification text. Outlet nozzles shall be made of the same high quality brass as the valve bodies. Other materials may be in contact with media where appropriate.
3. Provide piping for all service fixtures from valve to outlet: Galvanized iron or copper for water, air and vacuum and black iron for gas services.
4. Fixture fittings shall incorporate quick-connect compression fittings on the valve body (for the media inlet and media outlet) as well as the fume hood outlet nozzle. With this system, no soldering or brazing should be required to complete mechanical connections.
5. Fixtures exposed to fume hood interior. Brass with chemically resistant polyester powder lacquer color coded to the media.
6. Fixtures are to be provided with easy-to-mount attachment device for secure mounting in deck or wall mounted applications. System to be installed with simple hand tools.
7. Fittings are to be constructed to operate with the following maximum working pressure without leak or failure.
 - Water Fittings: 145 PSI
 - Non-Burning Gas: 145 PSI
 - Burning Gases: 100 PSI
 - Special Water Fittings: 145 PSI
 - Oxygen Fittings: 145 PSI
8. All outlets shall have detachable serrated nozzles.
9. All valves shall be front-loaded for ease of access and maintenance at point of use.

I. Hood light fixture: Two lamp/T8, rapid start, UL listed fluorescent light fixture with sound rated ballast installed on exterior of roof. Provide safety glass panel cemented and sealed to the hood roof.

1. Interior of fixture: White, high reflecting plastic enamel.
2. Size of fixture: Largest possible up to 48" for hoods with superstructures up to six feet. Provide two 36" fixtures for hoods with eight foot superstructures.

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3. Include lamps with fixtures.
 4. Illumination: Per performance values, Part 1 of this Section.
- J. Electrical services: Three wire grounding type receptacles rated at 120 V.A.C. at 20 amperes. Provide 250 V.A.C. receptacles where specified. Flush plates: Black acid resistant thermoplastic.
- K. Work surfaces: [Specified Option] 1-1/4" thick surface, dished a nominal one-half inch to contain spills.
1. Reinforced stainless steel work surfaces, either integral or attached, for hoods with stainless steel interiors.
 2. Molded resin work surfaces for hoods with Resisto-Roc or Poly-resin liners.
- L. Safety Monitor/Alarm System: [Specified Option]
Where shown or specified provide Safety Monitor/Alarm System which monitors face velocity and provides audible and visual alarm if face velocity drops below safe levels. The technology used in the **54LAF A500** and the **54LAF A1000** will be based on thermally compensated thermistor based in the alarm module. As the internal fume hood pressure changes as the sash opening is closed and opened, the flow passing over the thermistor is calibrated to a face velocity which is displayed on the front of the monitor.
1. Safety monitor: UL listed, tamper proof, with all alarm circuits, electric components, external tubing, and manifolds furnished complete and factory installed. The monitor shall have light emitting diode display which provides clear indication of airflow conditions.
 2. Calibration is the responsibility of the owner and is required once the hood is stationed and the hood exhaust and room supply systems are balanced. A secondary calibration has been factory set into the alarm's memory only to determine that the alarm is functional and ready for shipment. **The primary calibration must be completed in the field.**
 3. Airflow sensor: Thermally compensated glass-beaded thermistor, factory connected to a side-wall port on the interior of the fume hood.
 4. Alarm Signal: Audible signal and a visual, red large light emitting diode:
 - a. Silence pushbutton, which disables the audible alarm, shall be accessible on the front of the safety monitor.

- b. Provide alternate mode in which audible alarm is silenced indefinitely but visual alarm remains activated until the alarm condition is corrected.
 - c. When alarm condition is corrected and face velocity and volume return to specified levels, the Safety Monitor will automatically reset and begin routine monitoring.
5. Provide test circuit to verify proper Safety Monitor operation.
6. Electrical rating: Maximum 12 VDC, and maximum current rating of 200MA.

2.04 RESTRICTED BYPASS FUME HOODS

- A. Bypass shall be sufficient in size to allow 25% flow with sash closed. Bypass must be achieved through grill or louver on face of front lintel panel.
- B. Sash: [Standard vertical-rising] [With VAV applications.] [Optional vertical/horizontal sash]. [Optional horizontal sash.]
- C. Width: [36"] [48"] [60"] [72"] [96"].

2.04 VECTAMATIC-HORIZONTAL SLIDING SASH [NOT AVAILABLE IN SAFEAIRE II DESIGN]

2.05 BYPASS TYPE FUME HOODS

- A. Constant volume type with built-in automatic compensating bypass to maintain constant exhaust volume regardless of sash position.
- B. Bypass: Positive in action and controlled by the sash operation.
- C. Low impedance, directionally louvered panel provided in the lintel bypass area and one inch bypass provided immediately above the work surface and directly below the bottom horizontal sash rail. Designs which require all bypass to enter hood over front solid panel - not acceptable.
- D. As sash is lowered, bypass design shall limit the increase in face velocity to maximum of four times the average face velocity with the sash full open.
- E. Width: [48"] [60"] [72"] [96"].

2.07 AUXILIARY AIR FUME HOODS [NOT AVAILABLE IN SAFEAIRE II DESIGN]

2.08 PERCHLORIC ACID FUME HOODS

- A. Non-bypass design to contain washdown waters, with the face velocity and exhaust volume adjustable by raising and lowering the sash.
- B. Liner, work surface and trough: 16 gauge stainless steel with all vertical and horizontal corners and seamless joints between work surface and sides and back coved to a 1/2" radius, continuous, welded, ground and blended to a fine grained finish. Seams between working surface and sides and back not acceptable.
- C. Water wash down system: Provide raised edge at front of work surface and continuous trough across the full width at back of the work surface. Include (4) **each** stainless steel or plastic fog nozzles, internal piping, control valve and two 1-1/2 inch waste outlets, capable of flowing 30 G.P.M. Perforated pipe washdown system not acceptable.
- D. Width: [48"] [72"].
- E. Light fixture: Incandescent, vapor proof, fume resistant and UL listed fixture, installed in roof with bulb replacement from interior.

2.09 RADIOISOTOPE FUME HOODS

- A. Constant volume type with built-in automatic compensating bypass to maintain constant exhaust volume regardless of sash position.
- B. Bypass: Positive in action and controlled by the sash operation.
- C. Low impedance, directionally louvered panel provided in the lintel bypass area and one inch bypass provided immediately above the work surface and directly below the bottom horizontal sash rail. Designs which require all bypass to enter hood over front solid panel - not acceptable.

- D. As sash is lowered, bypass design shall limit the increase in face velocity to maximum of four times the average face velocity with the sash full open.
- E. Perimeter of access opening: Air foil or radiused or angled. Bottom horizontal foil shall provide nominal one inch bypass when sash is in the closed position. Bottom foil shall be removable without use of special tools. Provide powder coat on bottom foil to increase resistance to acid and abrasion.
- F. Width: [48"] [60"] [72"] [96"].
- G. Reinforce work surface to handle heavy loads (200 pounds per sq. ft.) from lead shielding.

2.10 METAL FINISH

- A. Preparation: Spray clean metal with a heated cleaner/phosphate solution, pretreat with iron phosphate spray, water rinse, and neutral final seal. Immediately dry in heated ovens, gradually cooled, prior to application of finish.
- B. Application: Electrostatically apply urethane powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a chemical resistant, high grade laboratory furniture quality finish of the following thicknesses:
 - 1. Exterior and interior surfaces exposed to view: 1.5 mil average and 1.2 mil minimum.
 - 2. Backs of cabinets and other surfaces not exposed to view: 1.0 mil average.

2.11 SOURCE QUALITY CONTROL TESTING OF FUME HOODS

At specified's option, insert here quality control testing requirements at the source (factory) as specified in Appendix G.1

PART 3 EXECUTION

3.01 INSTALLATION

- A. Installation:
1. Install fume hoods and equipment in accordance with manufacturer's instructions.
 2. Install equipment plumb, square, and straight with no distortion and securely anchored as required.
 3. Secure work surfaces to casework and equipment components with material and procedures recommended by the manufacturer.
- B. Accessory installation: Install accessories and fittings in accordance with manufacturer's recommendations.

3.02 FIELD QUALITY CONTROL TESTING OF FUME HOODS

At specified's option, insert here quality control testing requirements in the field as specified in Appendix G.2.
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3.03 ADJUSTING

- A. Repair or remove and replace defective work, as directed by [Architect] [Owner] upon completion of installation.
- B. Adjust sash, fixtures, accessories and other moving or operating parts to function smoothly.

3.04 CLEANING

- A. Clean equipment, touch up as required.

3.05 PROTECTION OF FINISHED WORK

- A. Provide all necessary protective measures to prevent exposure of equipment from exposure to other construction activity.
- B. Advise contractor of procedures and precautions for protection of material and installed fume hoods from damage by work of other trades.

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END OF SECTION