

SECTION 11610 - LABORATORY FUME HOODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Bench-top laboratory fume hoods.
2. Fume hood base cabinets.
3. Fume hood base stands.
4. Work tops within fume hoods.
5. Laboratory sinks and cup sinks in fume hoods.
6. Water, laboratory gas, and electrical service fittings in fume hoods.
7. Piping and wiring within fume hoods for service fittings, light fixtures, fan switches, and other electrical devices included with fume hoods.

- B. Related Sections:

1. Division 6 Section "[**Rough Carpentry**] [**Miscellaneous Carpentry**]" for wood blocking for anchoring fume hoods.
2. Division 9 Section "Non-Load-Bearing Steel Framing" for reinforcements in metal-framed partitions for anchoring fume hoods.
3. Division 9 Section "Resilient Wall Base and Accessories" for resilient base applied to fume hood base cabinets.
4. Division 12 Section "Laboratory Casework" for fume hood base cabinets and base stands, including work tops, sinks, and service fittings.
5. Division 15 Sections for fume hood duct connections, including ducts and exhaust fans.
6. Division 15 and 16 Sections for installing service fittings in fume hoods, including piping and wiring within fume hoods, and for other wiring in fume hoods, including connecting light fixtures, fan switches, and other electrical devices included with fume hoods.
7. Division 15 and 16 Sections for connecting service utilities at back of fume hoods. Piping and wiring within fume hoods are specified in this Section.
8. Division 15 Section "Testing, Adjusting, and Balancing" for field quality-control testing of fume hoods.

1.3 PERFORMANCE REQUIREMENTS

- A. Containment: Provide fume hoods that comply with the following when tested according to ASHRAE 110 at a release rate of 4.0 L/min.:

1. Average Face Velocity: 100 fpm (0.51 m/s) plus or minus 10 percent with sashes fully open.
 2. Face-Velocity Variation: Not more than 15 percent of average face velocity.
 3. Sash Position: Fully open.
 - a. Test hoods with combination sashes. Fully closed vertically, fully open horizontally with maximum opening on one side, with maximum opening in the center, and with one opening at each side equal to half of maximum opening.
 - b. Test hoods with vertical sashes at 15 inch opening.
 4. As-Manufactured (AM) Rating: AM 0.02 (0.02 ppm)
 5. As-Installed (AI) Rating: AI 0.10 (0.10 ppm)
- B. Static-Pressure Loss: Not more than 1/2-inch wg (124 Pa) at [100-fpm (0.51-m/s)] face velocity when measured at four locations 90 degrees apart around the exhaust duct and at least three duct diameters downstream from duct collar.
- C. Structural Performance: Provide fume hood components capable of withstanding the following loads without permanent deformation, excessive deflection, or binding of cabinet drawers and doors:
1. Fume Hood Base Stands: 50-lb/ft. (74-kg/m) work top, 75 lb/ft. (112 kg/m) on work top, plus weight of hood.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For laboratory fume hoods. Include plans, elevations, sections, details, and attachments to other work.
1. Indicate locations and types of service fittings together with associated service supply connection required.
 2. Indicate duct connections, electrical connections, and locations of access panels.
 3. Include roughing-in information for mechanical, plumbing, and electrical connections.
 4. Show adjacent walls, doors, windows, other building components, laboratory casework, and other laboratory equipment. Indicate clearances from above items.
 5. Include layout of fume hoods in relation to lighting fixtures and air-conditioning registers and grilles.
 6. Include coordinated dimensions for laboratory equipment specified in other Sections.
- C. Samples for Verification: For Type 304 Stainless No 2B Finish Exterior, Epoxy Interior lining, in manufacturer's standard sizes.
- D. Product Test Reports: Showing compliance with specified performance requirements for as-manufactured containment and static pressure loss based on evaluation of comprehensive tests performed by manufacturer.
- E. Field reports: By independent qualified certification group.
- F. Warranty: Warrant the fume hoods for one year from date of delivery.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Laboratory Fume Hoods: Obtain fume hoods from single manufacturer.
- B. Product Standards: Comply with SEFA 1, "Laboratory Fume Hoods - Recommended Practices." Provide fume hoods UL listed and labeled for compliance with UL 1805.
- C. Safety Glass: Products complying with testing requirements in 16 CFR 1201 for Category II materials.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or another suitable material.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install fume hoods until building is enclosed, wet work and utility roughing-in are complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.8 COORDINATION

- A. Coordinate installation of fume hoods with laboratory casework, fume hood exhaust ducts, and plumbing and electrical work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide ChemGARD Model FH4C manufactured by The Baker Company or comparable product by one of the following:
 1. Fisher Hamilton L.L.C.
 2. Kewaunee Scientific Corporation; Laboratory Products Group.
 3. Lab Crafters, Inc.
 4. Baker Company (The).

Other substitutions are not permitted.

2.2 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, stretcher-leveled standard of flatness.

- B. Epoxy: Factory molded, modified epoxy-resin formulation with smooth, nonspecular finish.
1. Physical Properties:
 - a. Flexural Strength: Not less than 10,000 psi (70 MPa).
 - b. Modulus of Elasticity: Not less than 2,000,000 psi (1400 MPa).
 - c. Hardness (Rockwell M): Not less than 100.
 - d. Water Absorption (24 Hours): Not more than 0.02 percent.
 - e. Heat Distortion Point: Not less than 260 deg F (127 deg C).
 - f. Flame-Spread Index: 25 or less per ASTM E 84.
 2. Chemical Resistance: Epoxy-resin material has the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.4.5:
 - a. No Effect: Acetic acid (98 percent), acetone, ammonium hydroxide (28 percent), benzene, carbon tetrachloride, dimethyl formamide, ethyl acetate, ethyl alcohol, ethyl ether, methyl alcohol, nitric acid (70 percent), phenol, sulfuric acid (60 percent), and toluene.
 - b. Slight Effect: Chromic acid (60 percent) and sodium hydroxide (50 percent).
 3. Color: Grey, black or white
 4. Chemical Resistance: Composite work top material has the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.4.5:
 - a. No Effect: Acetic acid (98 percent), acetone, ammonium hydroxide (28 percent), [benzene,] [carbon tetrachloride,] [dimethyl formamide,] ethyl acetate, ethyl alcohol, formaldehyde (37 percent), furfural, [hydrochloric acid (37 percent),] [hydrofluoric acid (48 percent),] [nitric acid (30 percent),] phosphoric acid (85 percent), [sodium hydroxide (20 percent),] sulfuric acid (33 percent), toluene[, and] [zinc chloride].
 5. Color: Black or White
- C. Glass: Clear, safety plate glass sash panels, 12" wide complying with ASTM C 1172, Kind LT, Condition A, Type I, Class I, Quality-Q3; with two lites not less than 3.0 mm thick and with clear, polyvinyl butyral interlayer.
- D. Fasteners: Provide stainless-steel fasteners.
- E. Illumination: Externally mounted lighting fixture with solid state ballasts producing 50 foot candles at work surface.
- F. Electrical Requirements: 115V, 60 Hz, 20 amps. Provide two GFI duplex outlets with 10amp breaker.
- 2.3 FUME HOOD VENTILATION
- A. Continuous Bypass Fume Hoods: Provide continuous bypass air at all sash positions introducing fresh air curtain behind sash to reduce interior concentrations. Design continuous

bypass to maintain sufficient exhaust air volume through hood to adequately dilute hazardous fumes regardless of sash position.

- B. Variable-Air-Volume Control: Equip fume hoods with an electronic control unit with a sensing device that monitors face velocity, and a motorized damper on the exhaust connection that maintains a constant face velocity by controlling air volume in response to control unit. Equip units with manual override switch that opens motorized damper to provide maximum exhaust capacity regardless of sash position.
 - 1. Provide output transmitter on electronic control unit that produces 0- to 10-V dc signal proportional to fume hood exhaust volume for interface with building's HVAC control system.
- C. Exhaust Requirements:
 - 1. FH4 – Combination Sash
 - a. 808 CFM @ 0.42" w.c. (100FPM Vertical Sash at Max Height)
 - b. 374 CFM @ 0.11" w.c. (100FPM Horizontal Sash at Max Height)
 - 2. FH5 – Combination Sash
 - a. 1047 CFM @ 0.70" w.c. (100FPM Vertical Sash at Max Height)
 - b. 405 CFM @ 0.11" w.c. (100FPM Horizontal Sash at Max Height)
 - 3. FH6 – Combination Sash
 - a. 1286 CFM @ 0.85" w.c. (100FPM Vertical Sash at Max Height)
 - b. 644 CFM @ 0.25" w.c. (100FPM Horizontal Sash at Max Height)
 - 4. FH8 – Combination Sash – Check literature on static, lower??
 - a. 1754 CFM @ 0.52" w.c. (100 FPM Vertical Sash at Max Height)
 - b. 900 CFM @ 0.16" w.c. (100 FPM Horizontal Sash at Max Height)

2.4 FABRICATION

- A. General: Assemble fume hoods in factory to greatest extent possible. Disassemble fume hoods only as necessary for shipping and handling limitations. Fume hoods shall be capable of being partly disassembled as necessary to permit movement through a 35-by-79-inch (889-by-2007-mm) door opening.
- B. Stainless Steel Exterior: Fabricate from steel sheet, 18 gauge not less than 0.0478 inch (1.2 mm) thick, with component parts screwed together to allow removal of end panels, front fascia, and airfoil and to allow access to plumbing lines and service fittings. Apply chemical-resistant finish to interior and exterior surfaces of component parts before assembly.
- C. Ends: Fabricate with double-wall end panels without projecting corner posts or other obstructions to interfere with smooth, even airflow. Close area between double walls at front of fume hood and as needed to house sash counterbalance weights, utility lines, and remote-control valves.
- D. Splay top and sides of face opening at 40 degree included angle to provide an aerodynamic shape to ensure smooth, even flow of air into fume hood.
- E. Interior Lining: Provide the following unless otherwise indicated:
 - 1. Stainless steel, not less than 16 gauge (.060 inches) nominal thickness.

- F. Lining Assembly: Unless otherwise indicated, assemble with stainless-steel fasteners.
1. Fume hood liner components of epoxy coated, 16 gauge, 304 stainless steel shall be bolted together with stainless steel hardware to form the fume hood superstructure.
 2. Punch fume hood lining side panels to receive service fittings and remote controls. Provide removable plug buttons for holes not used for indicated fittings.
- G. Rear Baffle: Unless otherwise indicated, provide baffle, of same material as fume hood lining, at rear of hood with openings at top and bottom for airflow through hood. Secure baffle to weld studs on hood liner with stainless-steel hardware. Fabricate baffle for easy removal for cleaning behind baffle.
1. Provide preset baffles of 16 gauge 304 stainless steel that can be removed through front opening.
 2. Provide integrated perforated stainless-steel protective grille at bottom baffle opening to prevent paper from being drawn into the exhaust plenum behind baffles.
- H. Exhaust Plenum: Full width of fume hood and with adequate volume to provide uniform airflow from hood, of stainless steel, and with duct stub for connection to 10" duct.
1. Duct-Stub Material: Epoxy coated stainless steel
- I. Bypass Grilles: Continuous bypass duct to be sight tight.
- J. Sashes: Provide operable sashes of type indicated.
1. Fabricate from [0.050-inch- (1.27-mm-) nominal thickness stainless steel] [0.048-inch- (1.21-mm-)]. Form into four-sided frame with bottom corners welded and finished smooth.
 2. Glaze with laminated safety glass.
 3. Counterbalance vertical/horizontal combination sash with sash weight and stainless steel cable system to hold sash in place regardless of position. Provide ball-bearing sheaves, plastic glides in stainless-steel guides, and aerodynamic full width stainless steel lift handle. Provide rubber bumpers at top and bottom of each sash unit. Fabricate horizontal-sliding sashes hung from adjustable nylon-tired, ball-bearing sheaves supported on an overhead stainless-steel track. Provide a lower track for guiding sashes only. Sashes shall bypass and be removable. Provide flush finger pulls and rubber bumpers at both stiles of each sash.
- K. Airfoil: Unless otherwise indicated, provide airfoil at bottom of fume hood face opening with 2-inch (50-mm) space between airfoil and work top. Sash closes on top of airfoil, leaving 2-inch (50-mm) opening for air intake. Airfoil directs airflow across work top to remove heavier-than-air gases and to prevent reverse airflow.
1. Fabricate airfoil from stainless steel, sight tight.
- L. Light Fixtures: Provide vapor proof, two-tube, rapid-start, fluorescent light fixtures, of longest practicable length; complete with tubes at each fume hood. Shield tubes from hood interior with 1/4-inch- (6.35-mm-) thick laminated safety glass, sealed into hood with chemical-resistant rubber gaskets. Provide units with fluorescent tubes easily replaceable from outside of fume hood.

- M. Fume Hood Base Adjustable Stands: Fabricated from not less than 2-inch- (50-mm-) square, electrically welded steel tubing. Provide leg stretchers where necessary to comply with structural performance requirements. Weld leg stretchers, cross stretchers, and work top support rails to legs, and finish entire assembly. Provide leveling device at each corner of base stand at floor. Adjustability 27 15/16 to 30 15/16”
1. Provide clear floor space not less than 30 inches (760 mm) wide by 25 inches (635 mm) deep by 27 inches (685 mm) high within fume hood base stands unless otherwise indicated.
- N. Work Top Sinks:
1. Work Tops, General: Provide units with smooth surfaces free of defects. Make exposed edges and corners straight and uniformly beveled. Where acid storage cabinets are indicated beneath fume hoods, provide holes in work tops as need to accommodate cabinet vents.
 2. Epoxy Resin Work Tops: Provide front overhang of 1 inch (25 mm), with continuous drip groove on underside 1/2 inch (13 mm) from edge.
 - a. Work Top Material: Solid epoxy composition with raised (marine) edge in first subparagraph below if required. NFPA 45 requires that hoods be provided with a means of containing minor spills.
 - b. Work Top Configuration: Raised (marine) edge, 1 inch (25 mm) thick at raised edge, with rounded front edge and beveled corners.
 3. Sinks, General: Provide sizes indicated or laboratory casework manufacturer's closest standard size of equal or greater volume, as approved by Architect.
 - a. Outlets: Provide with strainers and tailpieces, NPS 1-1/2 (DN 40), unless otherwise indicated.
 4. Epoxy Sinks: Molded in one piece with smooth surfaces, coved corners, and bottom sloped to outlet; 1/2-inch (13-mm) minimum thickness.
 - a. Provide sinks for drop-in installation with 1/4-inch- (6-mm-) thick lip around perimeter of sink.
 - b. Provide integral sinks in epoxy work tops, bonded to tops with invisible joint line.
- O. Ceiling Extensions: Provide filler panels matching fume hood exterior to enclose space above fume hoods at front and sides of fume hoods and extending from tops of fume hoods to ceiling.
- P. Finished Back Panels: Where rear surfaces of fume hoods are exposed to view, provide finished back panels matching rest of fume hood enclosure.
- Q. Comply with requirements in Divisions 15 and 16 Sections for installing water and laboratory gas service fittings, piping, electrical devices, and wiring. Install according to Shop Drawings. Securely anchor fittings, piping, and conduit to fume hoods unless otherwise indicated.

2.5 CHEMICAL-RESISTANT FINISH

- A. General: Prepare, treat, and finish welded assemblies after welding. Prepare, treat, and finish components that are to be assembled with mechanical fasteners before assembling. Prepare, treat, and finish concealed surfaces same as exposed surfaces.
- B. Preparation: Clean steel surfaces, other than stainless steel, of mill scale, rust, oil, and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.
- C. Chemical-Resistant Finish of Liner: Immediately after cleaning and pretreating, apply fume hood manufacturer's standard two-coat, chemical-resistant, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).
 - 1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8. Acceptance level for chemical spot test shall be no more than four Level 3 conditions.
 - 2. Colors for Fume Hood Finish: As indicated by manufacturer's designations

2.6 ACCESSORIES

- A. Service Fittings: Comply with requirements in Division 12 Section "Laboratory Casework."
 - 1. Provide service fittings with exposed surfaces, including fittings, escutcheons, and trim, made of brass with a chrome finish.
- B. Airflow Indicator: Provide each fume hood with airflow indicator of the following type(s):
 - 1. Indicator Type: Thermal anemometer that measures fume hood face velocity and displays data as digital readout.
- C. Airflow Alarm: Provide fume hoods with audible and visual alarm that activates when airflow sensor reading is outside of preset range.
 - 1. Provide with thermal-anemometer airflow sensor.
 - 2. Provide with switch that silences audible alarm and automatically resets when airflow returns to within preset range.
- D. Sash Stops: Provide fume hoods with sash stops to limit hood opening to 50 percent of sash height. Sash stops can be manually released to open sash fully for cleaning fume hood and for placing large apparatus within fume hood.
- E. Optional
 - 1. General Purpose Base Stand
 - 2. Acid Storage Base Stand
 - 3. Solvent Storage Base Stand
 - 4. Cold Water Gooseneck Faucet
 - 5. Cold Water Gooseneck Faucet with vacuum breaker
 - 6. Cup Sink – 3" x 5" x 6"
 - 7. SS Pegboard

8. Aspirator
9. Vent Package
10. Epoxy Work Shelf

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fume hoods.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fume hoods according to Shop Drawings and manufacturer's written instructions. Install level, plumb, and true; shim as required, using concealed shims, and securely anchor to building and adjacent laboratory casework. Securely attach access panels, but provide for easy removal and secure reattachment. Where fume hoods abut other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
- B. Comply with requirements in Division 12 Section "Laboratory Casework" for installing fume hood base cabinets, work tops, and sinks.
- C. Comply with requirements in Divisions 15 and 16 Sections for installing water and laboratory gas service fittings and electrical devices.
 1. Install fittings according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer's written instructions. Set bases and flanges of sink and work top-mounted fittings in sealant recommended by manufacturer of sink or work top material. Securely anchor fittings to fume hoods unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

- A. Field test installed fume hoods according to "Flow Visualization and Velocity Procedure" requirements in ASHRAE 110.
 1. Test one installed fume hood, selected by Architect, for each type of hood installed, according to ASHRAE 110[as modified in "Performance Requirements" Article].[If tested hood fails to meet performance requirements, field test additional hoods as directed by Architect.]
 2. Adjust fume hoods, hood exhaust fans, and building's HVAC system, or replace hoods and make other corrections until tested hoods perform as specified.
 3. After making corrections, retest fume hoods that failed to perform as specified.

3.4 ADJUSTING AND CLEANING

- A. Adjust moving parts for smooth, near silent, accurate sash operation with one hand. Adjust sashes for uniform contact of rubber bumpers. Verify that counterbalances operate without interference.
- B. Clean finished surfaces, including both sides of glass; touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION 11610