

SECTION 11600

LABORATORY FUME HOODS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 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 06 Section "*Rough Carpentry*" for wood blocking for anchoring fume hoods.
2. Division 09 Section "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring fume hoods.
3. Division 09 Section "Resilient Base and Accessories" for resilient base applied to fume hood base cabinets.
4. Division 23 Sections for fume hood duct connections, including ducts and exhaust fans.
5. Division 23 and 26 Sections for connecting service utilities at top of fume hoods. Piping and wiring within fume hoods are specified in this Section.
6. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for field quality-control testing of fume hoods.

1.03 PERFORMANCE REQUIREMENTS

- A. Containment: Provide fume hoods that comply with the following when tested according to ASHRAE 110.

1. Average Face Velocity: **100 fpm** plus or minus 10 percent with sashes fully open.
2. Face-Velocity Variation: Not more than **10%** percent of average face velocity.
3. Sash Position: Fully open.
 - a. Test hoods with horizontal sashes 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 combination sashes fully raised, 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.
4. As-Manufactured (AM) Rating: [**AM 0.05 (0.05 ppm)**]

- B. 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[**for Fume Hoods Other Than Radioisotope Hoods**]: 75 lb/ft. (112 kg/m) on work top, plus weight of hood.

1.04 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 details for anchoring fume hoods to permanent building construction including locations of blocking and other supports.
 2. Indicate locations and types of service fittings together with associated service supply connection required.
 3. Indicate duct connections, electrical connections, and locations of access panels.
 4. Include roughing-in information for mechanical, plumbing, and electrical connections.
 5. Show adjacent walls, doors, windows, other building components, laboratory casework, and other laboratory equipment. Indicate clearances from above items.
 6. Include layout of fume hoods in relation to lighting fixtures and air-conditioning registers and grilles.
 7. Include coordinated dimensions for laboratory equipment specified in other Sections.
- C. Samples for Initial Selection: **For fume hood and Casework exterior finishes.**
- D. Remaining paragraphs are defined in Division 01 Section "Submittal Procedures" as "Informational Submittals."
- E. 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 and witnessed by a qualified testing agency.

1.05 QUALITY ASSURANCE

- A. Source Limitations for Laboratory Fume Hoods: Obtain fume hoods from single manufacturer.
 1. Obtain from same source as laboratory casework specified in Division 12 Section "Laboratory Casework."
- B. Product Designations: Drawings indicate sizes, types, and configurations of fume hoods by referencing designated manufacturer's catalog numbers. Other manufacturers' hoods of similar sizes, types, and configurations, and complying with the Specifications, may be considered. See Division 01 Section "Product Requirements."
- C. Provisions in this Section are generally as stringent as those in UL 1805, but authorities having jurisdiction may require that fume hoods be UL listed and labeled. See Evaluations.
- D. Product Standards: Comply with SEFA 1, "Laboratory Fume Hoods - Recommended Practices. **Provide only fume hoods UL listed and labeled for compliance with UL 1805.**
- E. Safety Glass: Products complying with testing requirements in 16 CFR 1201 for Category II materials.
 1. Permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Pre-installation Conference: Conduct conference at Project site

1.06 DELIVERY, STORAGE, AND HANDLING

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

1.07 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.

1.08 COORDINATION

A. Coordinate layout and installation of framing and reinforcements for lateral support of fume hoods.

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

1.09 EXTRA MATERIALS

A. Furnish complete touchup kit for each type and color of fume hood finish provided. Include fillers, primers, paints, and other materials necessary to perform permanent repairs to damaged fume hood finish.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following.

B. Basis-of-Design Product: Provide as manufactured by **National Laboratory Specialists** (888-457-5554) or comparable product by one of the following:

C. Manufacturers in list below make a variety of hoods with metal exterior suitable for most educational, industrial, and research applications.

2. Labconco

3. Fisher Hamilton L.L.C.

4. Kewaunee Scientific Corporation; Laboratory Products Group.

2.02 MATERIALS

A. Steel Sheet: Cold-rolled, commercial steel (CS) sheet, complying with ASTM A 1008/A 1008M; matte finish; suitable for exposed applications.

- B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- C. Glass-Fiber-Reinforced Polyester: Polyester laminate with a chemical-resistant gel coat on the exposed face, and having a flame-spread index of 25 or less per ASTM E 84.
- D. Epoxy: Factory molded, modified epoxy-resin formulation with smooth, nonspecular finish.
 - 1. Manufacturers: provide products by one of the following
 - a. Durcon Company (The).
 - b. Epoxyn Products.
 - c. Laboratory Tops, Inc.
 - d. Prime industries, inc.
 - 2. Physical Properties:
 - a. Flexural Strength: Not less than 10,000 psi
 - b. Modulus of Elasticity: Not less than 2,000,000 psi
 - 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
 - f. Flame-Spread Index: 25 or less per ASTM E 84.
 - 3. 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).
 - 4. Color: **[Black]**.
- E. Glass in fume hood sashes should generally be laminated because laminated glass will still contain fumes if broken.
- F. Fasteners: Provide stainless-steel fasteners where exposed to fumes.

2.03 FUME HOOD VENTILATION

- A. Bypass Fume Hoods: Provide bypass fume hoods. Compensating bypass above sash opens as sash is closed. Provide sufficient bypass capacity so that face velocity with sash opening of 6 inches does not exceed three times the face velocity with sash fully open.
- B. Auxiliary Air: For the Extraction Room fume hood only (Type 2 Hood) provide fume hood with auxiliary-air outlet for connection to a system that supplies air from an external source equal to 70 percent of the exhausted air volume. Auxiliary-air system introduces air directly above and immediately in front of hood face. Capture efficiency of hoods shall be 90 percent minimum.

2.04 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 door opening.

- B. Steel Exterior: Fabricate from steel sheet, not less than 18 Gauge thick, with component parts blindly screwed together to allow removal of end panels, front fascia, and airfoil and to allow access to plumbing lines and service fittings. Exposed fasteners will not be accepted. Apply chemical-resistant finish to interior and exterior surfaces of component parts before assembly.
- C. 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. Hoods are to be fabricated full a full galvanized metal pan, backing the interior liner on both ends and top of hood. "skeleton" frame's will not be accepted.
- D. Splay top and sides of face opening to provide an aerodynamic shape to ensure smooth, even flow of air into fume hood.
- E. Interior Lining:
 - 1. Glass-fiber-reinforced polyester, not less than 3/16" thick. Color to be white.
- F. Lining Assembly: Unless otherwise indicated, assemble with stainless-steel fasteners or epoxy adhesive, concealed. Seal joints by filling with chemical-resistant sealant during assembly.
 - 1. Fasten lining components to a rigid full pan frame assembly fabricated from galvanized steel and to which exterior panels are attached.
 - 2. Punch fume hood lining side panels to receive service fittings and remote controls. Provide holes only at locations to be used for indicated fittings. Plugs in additional holes are not acceptable.
- G. Rear Baffle: 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 cleats at rear of hood with stainless-steel screws. Fabricate baffle for easy removal for cleaning behind baffle.
 - 1. Provide fixed non-adjustable baffles.
- H. Exhaust Plenum: Full width of fume hood and with adequate volume to provide uniform airflow from hood, of same material as hood lining, and with duct stub for exhaust connection.
 - 1. Duct-Stub Material: Type 304 18 gauge stainless steel.
- I. Bypass : By-pass grilles will not be accepted, bypass openings must be a linear opening on the hood face.
- J. Sashes: Provide operable sashes of type indicated.
 - 1. Fabricate from 18 gauge Type 304 stainless steel. Form into four-sided frame with bottom corners welded and finished smooth. Make top member removable for glazing replacement. Set glazing in chemical-resistant, U-shaped gaskets.
 - 2. Glaze with laminated safety glass.
 - 3. Counterbalance vertical-sliding sash with sash weight and Chain and sprocket system to hold sash in place regardless of position. Provide ball-bearing sheaves, plastic glides in stainless-steel guides, and aluminum-steel lift handles. Provide rubber bumpers at top and bottom of each sash unit.
 - 4. Fabricate horizontal-sliding sashes hung from adjustable nylon-tired, ball-bearing sheaves supported on an overhead stainless-steel track. Provide a lower track for guid-

- K. Airfoil: Unless otherwise indicated, provide airfoil at bottom of fume hood face opening with 1-inch space between airfoil and work top. Sash closes on top of airfoil, leaving 1-inch 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 Type 304 stainless steel
 - 2. 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 thick laminated glass or 3-mm-thick tempered glass, sealed into hood with chemical-resistant rubber gaskets. Provide units with fluorescent tubes easily replaceable from outside of fume hood.
 - 3. Provide fluorescent tubes with color temperature of 3500 K and minimum color-rendering index of 85.
- L. Base Cabinets: Provide metal base cabinets in finish matching fume hood exterior finish, see drawings for types and locations.
- M. Fume Hood Base Stands: Fabricated from not less than 2-inch 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 with chemical-resistant finish. Provide leveling device at each corner of base stand at floor.
 - 1. Provide clear floor space not less than 30" wide by 27 inches deep within fume hood base stands unless otherwise indicated.
- N. Work Top :
 - 1. Work Tops, General: Provide units with smooth surfaces free of defects. Make exposed edges and corners straight and uniformly beveled. .
 - 2. Resin Work Tops: Provide front overhang of 1 inch, with continuous drip groove on underside.
 - a. Work Top Material: Solid epoxy resin composition
 - b. Work Top Configuration: Raised (marine) edge, 1-1/4 inches thick at raised edge, with **beveled** edge and corners.
- O. Filler Strips: Provide as needed to close spaces between fume hoods or fume hood base cabinets and adjacent building construction. Fabricate from same material and with same finish as fume hoods.
- P. 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. Supplied with hinged access door's.
- Q. Finished Back Panels: Where rear surfaces of fume hoods are exposed to view, provide finished back panels matching rest of fume hood enclosure.
- R. Comply with requirements in Divisions 23 and 26 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.

2.05 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: 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.
 - 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. Insert other chemical-resistance requirements based on specific chemicals to be used in Project's laboratories if required.
 - 3. Select one of three options in subparagraph below. If retaining first, indicate colors in a separate schedule.
 - 4. Colors for Fume Hood Finish: As selected by Architect from manufacturer's full range of standard colors.

2.06 ACCESSORIES

- A. Service Fittings: Are to be manufactured by the "Chicago Fixture Company" and must Comply with requirements in Division 12 Section "Laboratory Casework."
 - 1. Provide service fittings with exposed surfaces, including fittings, escutcheons, and trim, finished with acid- and solvent-resistant powder coating complying with requirements in SEFA 7 for corrosion-resistant finishes.
- B. Airflow Indicator: Provide each fume hood with airflow indicator of the following type
 - 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 airflow sensor.
 - 2. Provide with reset and test switches.
 - 3. 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.

2.07 SOURCE QUALITY CONTROL

- A. Demonstrate fume hood performance before shipment by testing one fume hood for each type required according to ASHRAE 110 as modified in "Performance Requirements" Article. Provide testing facility, instruments, equipment, and materials needed for tests.

PART 3 - EXECUTION

3.01 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.

3.02 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. Coordinate first paragraph below with Drawings and Division 12 Section "Laboratory Casework." If fume hoods are standalone units with base cabinets that are not similar to laboratory casework used on Project or if no additional laboratory casework is required other than fume hood base cabinets, consider deleting below and copying and inserting applicable requirements from Division 12 Section "Laboratory Casework."
- C. Comply with requirements in Division 12 Section "Laboratory Casework" for installing fume hood base cabinets, work tops, and sinks.

3.03 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, re-test fume hoods that failed to perform as specified.

3.04 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.

3.05 FUME HOOD SCHEDULE

END OF SECTION

LABORATORY FUME HOODS
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