

SECTION 11 53 00 (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. This Section includes the following:
 - 1. Bench-top laboratory fume hoods.
 - 2. Fume hood base cabinets with countertops.
 - 3. Laboratory sinks and cup sinks in fume hoods.
 - 4. Water, laboratory gas, and electrical service fittings in fume hoods.
 - 5. Pre-piping and pre-wiring within fume hoods for service fittings, light fixtures, blower switches, and other electrical devices.
- B. Related Sections include the following:
 - 1. Division 6 Section "Miscellaneous Carpentry" for wood blocking for anchoring fume hoods.
 - 2. Division 9 Section "Gypsum Board Assemblies" for reinforcements in metal-framed gypsum board 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 "Wood Laboratory Casework" for fume hood base cabinets, including countertops, sinks, and service fittings.
 - 5. Division 15 Section "Testing, Adjusting, and Balancing" for field quality-control testing of fume hoods.
 - 6. Division 15 Sections for fume hood duct connections, including ducts.
 - 7. 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, blower switches, and other electrical devices.
 - 8. 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.

1.3 PERFORMANCE REQUIREMENTS

- A. Containment: Provide fume hoods that comply with the following when tested according to ASHRAE 110 as modified below at a release rate of 4.0 L/min.:
 - 1. Average Face Velocity: 80 fpm plus or minus 10 percent with sashes half or 50% open. 55 fpm with sash 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)**.
 5. As-Installed (AI) Rating: AI **0.05 (0.05 ppm)**.
 6. Test Setup Modifications: Conduct tests with a minimum of 3 and a maximum of 5 people in the test room and with two 1-gal. round paint cans, one 12-by-12-by-12-inch cardboard box, and three 6-by-6-by-12-inch cardboard boxes in the fume hood during the test. Position items from 6 to 10 inches behind the sash, randomly distributed, and supported off the work surface by 2-by-2-inch blocks.
 7. Walk-by Test: At the conclusion of containment test, execute 3 rapid walk-bys at 30-second intervals, 12 inches behind the manikin. Test-gas concentration during each walk-by shall not exceed 0.1 ppm and shall return to specified containment value within 15 seconds.
- B. Static-Pressure Loss: Not more than [**1/4-inch wg**] at [**100-fpm ((0.51-m/s))**] face velocity when tested according to Paragraph 6.4.2.4 in SEFA 1.2, "Laboratory Fume Hoods--Recommended Practices."
- C. Seismic Performance: Provide fume hood anchorages capable of withstanding the effects of earthquake motions determined according to **ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."**
1. Seismic Design Criteria: Comply with BOCA 99.

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 details for anchoring fume hoods to permanent building construction including locations of blocking and other supports. Include calculations demonstrating that anchorages comply with seismic performance requirements.
 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 factory-applied finishes epoxy sinks and epoxy countertops.
- D. Samples for Verification: For factory-applied finishes interior lining and countertop material, in manufacturer's standard sizes.

- E. Product Test Reports: Based on evaluation of comprehensive tests according to SEFA 1.2, "Laboratory Fume Hoods--Recommended Practices" and ASHRAE 110 performed by manufacturer and witnessed by a qualified independent testing agency, for fume hoods.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain laboratory fume hoods through one source from a single manufacturer.
 - 1. Obtain through same source as laboratory casework specified in Division 12 Section "Wood 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. Refer to Division 1 Section "Product Requirements."
- C. Product Standard: Comply with SEFA 1.2, "Laboratory Fume Hoods--Recommended Practices."
- D. Safety Glass: Products complying with testing requirements in 16 CFR 1201 for Category II materials.
 - 1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use. Hood shall be UL listed label; UL #3101.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.9 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**2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Jamestown Metal Products, Inc.
 - 2. Kewaunee Scientific Corporation; Laboratory Division.
 - 3. Labconco Corporation.
 - 4. Baker Company (The).

2.2 MATERIALS

- A. Steel Sheet: Cold-rolled commercial steel sheet, complying with ASTM A 1008/A 1008M; matte finish; suitable for exposed applications.
- B. Stainless-Steel Sheet: ASTM A 666, Type 304; stretcher-leveled standard of flatness.
- C. Glass-Fiber-Reinforced Polyester: Polyester laminate complying with ASTM D 4357, with a chemical-resistant gel coat on the exposed face, and having a flame-spread index of 6 or less per ASTM E 84.
- D. Epoxy: Factory molded of modified epoxy-resin formulation complying with Division 12 Section "Wood Laboratory Casework" and having a flame-spread index of 25 or less per ASTM E 84.
- E. Epoxy: Factory molded of modified epoxy-resin formulation with smooth, nonspecular finish.
 - 1. 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.
 - 2. 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).
- F. Glass-Fiber Cement Board: ASTM C 1186.
- G. Tempered Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality q3.
- H. Laminated Safety Glass: ASTM C 1172, Kind LT, Condition A, Type I, Class I, Quality q3 with clear, polyvinyl butyral interlayer.
- I. Fasteners: Provide stainless-steel fasteners where exposed to fumes.

2.3 RESTRICTED BYPASS FUME HOODS

- A. Provide fume hoods with partial compensating bypass above sash, which opens after sash is closed to less than 40 percent open. Design partial bypass to maintain sufficient exhaust air volume through hood to adequately dilute hazardous fumes regardless of sash position.

2.4 FABRICATION

- A. General: Preassemble 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. Steel Exterior: Fabricate from steel sheet, 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. Max width: 4".
- 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: Provide one of the following, unless otherwise indicated:
 - 1. Glass-fiber-reinforced polyester, not less than 1/4 inch thick.
 - 2. Modified Epoxy, not less than 1/4 inch thick.
- F. Lining Assembly: Unless otherwise indicated, assemble with stainless-steel fasteners or epoxy adhesive, concealed where possible. Seal joints by filling with chemical-resistant sealant during assembly.
 - 1. Fasten lining components together with stainless- steel cleats or angles to form a rigid assembly to which exterior panels are attached.
 - 2. Fasten lining components to a rigid frame assembly fabricated from stainless steel and to which exterior panels are attached.
 - 3. 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: 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 adjustable baffles with control adjustment strips at top and bottom with plastic or stainless-steel knobs.
 2. Provide epoxy-coated stainless-steel screen 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 same material as hood lining, and with duct stub for exhaust connection.
1. Duct-Stub Material: stainless steel, unless otherwise indicated.
- I. Bypass Grilles: Provide grilles at bypass openings of bypass and restricted bypass fume hoods.
- J. Sashes: Provide operable sashes of type indicated.
1. Fabricate from 0.0500-inch-nominal thickness 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, with 1/4"-thick plies.
 3. Counterbalance vertical sliding sash with sash weight and stainless-steel cable system. Provide ball-bearing sheaves, plastic glides in stainless-steel guides, and stainless-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 guiding sashes only. Sashes shall bypass and be removable. Provide flush finger pulls and rubber bumpers at both stiles of each sash. (combo sash)
 5. Provide sash opening height of 30 inches , unless otherwise indicated.
- K. Provide airfoil at bottom of sash opening to direct airflow across countertop from 1-inch (25-mm) space between airfoil and countertop.
1. Fabricate airfoil from stainless steel.
- L. Light Fixtures: Provide vaporproof, 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 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.
1. Provide fluorescent tubes with color temperature of 3500 K and minimum color-rendering index of 85.
- M. Base Cabinets: Comply with Division 12 Section "Wood Laboratory Casework."
- N. Countertops Cup Sinks:
1. Resin Countertops: Fabricate with front overhang of 1 inch (25 mm) over base cabinets, continuous drip groove on underside 1/2 inch (13 mm) from edge, and factory cutouts for sinks.
 - a. Countertop Material: Epoxy composition, uniform throughout full thickness.

- b. Countertop Configuration: Raised (marine) edge, 1 inch thick at raised edge, with rounded edge and corners.
- 2. Cup Sinks: Epoxy, 3-by-6-inch nominal size.
 - a. Provide with polypropylene strainers and integral tailpieces.
- 3. Cup Sinks: Material and size as indicated.
 - a. Provide epoxy cup sinks with polypropylene strainers and integral tailpieces.
- 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 or fume hood base cabinets, as applicable.
- P. 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. 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.
- B. 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 (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: Match Architect's samples.

2.6 ACCESSORIES

- A. Service Fittings: Comply with requirements in Division 12 Section "Wood Laboratory Casework".
 - 1. Provide service fittings with exposed surfaces, including fittings, escutcheons, and trim, finished with acid- and solvent-resistant, baked-on plastic coating in manufacturer's standard color as approved by Architect.
- B. Airflow Indicator: Provide fume hoods with airflow indicator of the following type:
 - 1. Indicator Type: Thermal anemometer that measures fume hood face velocity and displays data as digital readout w/ one hour time line reading for performance.
- 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 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.
- E. Bypass Grille Blank-off Panel: Provide fume hoods with blank-off panel on bypass grille designed for use with sash stops to reduce exhaust air volume and provide design face velocity with sash at 50 percent open position.

2.7 SOURCE QUALITY CONTROL

- A. Demonstrate fume hood performance before and after shipment by testing all fume hoods according to ASHRAE 110 as modified in Part 1 "Performance Requirements" Article. Provide testing facility, instruments, equipment, and materials needed for tests.

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.
 1. 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 "Wood Laboratory Casework" for installing fume hood base cabinets, countertops, and sinks.
- C. 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 and manufacturer's written instructions. Securely anchor fittings, piping, and conduit to fume hoods, unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

- A. Field test installed fume hoods according to SEFA 1.2, "Laboratory Fume Hoods--Recommended Practices" to demonstrate proper operation.
 1. Test all installed fume hood, according to ASHRAE 110 as modified in Part 1 "Performance Requirements"

- B. Field test installed fume hoods according to ASHRAE 110 as modified in Part 1 "Performance Requirements" Article to verify compliance with performance requirements.
 - 1. Adjust fume hoods, hood exhaust fans, and building's HVAC system, or replace hoods and make other corrections until tested hoods perform as specified.
 - 2. 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