

SECTION 115313 - LABORATORY FUME HOODS

PART 1 - GENERAL

1.1 M.S.U. ISSUES

- A. Ductless or auxiliary air hoods are not acceptable.
- B. Perchloric Acid hoods are not acceptable.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Bench-top laboratory fume hoods.
 - 2. Walk-in laboratory fume hoods.
- B. Related Sections include the following:
 - 1. Division 12 Section METAL LABORATORY CASEWORK for fume hood base cabinets and base stands, including countertops, sinks, and service fittings.

1.3 PERFORMANCE REQUIREMENTS

- A. Containment: Provide fume hoods that comply with the following when tested according to ASHRAE 110 and relevant portions of NFPA 45 at a release rate of 4.0 L/min.:
 - 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. 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.
 - 4. 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.
 - 5. As-Manufactured (AM) Rating: 4.0 AM 0.01 (0.01 ppm).
 - 6. As-Installed (AI) Rating: 4.0 AI 0.10.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Must include dimensions, details of construction and installation, name of manufacturer, model, utility connections, manufacturer's standard color selections, and interior lining type, color and finish, and noise level produced in normal operation.

- 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 Face opening; face opening variation, air volume and static pressure drop data.

- C. Product Test Reports, when specified: 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. Product Standard: Comply with SEFA 1.2, "Laboratory Fume Hoods--Recommended Practices."

- B. Safety Glass: Products complying with testing requirements in 16 CFR 1201 for Category II materials.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. All materials shall be delivered in original, unbroken, brand marked containers or wrappings.

- B. Handle and store materials in accordance with manufacturer's directions and in a manner which will prevent:
 - 1. Deterioration or damage.
 - 2. Contamination with foreign matter.
 - 3. Damage by weather or elements.

- C. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material. Reject damaged, deteriorated or contaminated material and immediately remove from the site. Replace rejected materials with new materials at no additional cost to the owner.

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 any future damage to the fume hood finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Supreme Air Series by Kewaunee Scientific Corporation; Laboratory Division, or approved equivalent by:
 - 2. Baker Company (The).
 - 3. BMC
 - 4. Fisher Hamilton L.L.C.
 - 5. Mott Manufacturing Ltd.
 - 6. Jamestown Metal Products
- B. No substitutions.

2.2 Materials

- A. Steel sheet: Commercial-quality, cold-rolled, carbon-steel complying with ASTM A 1008; matte finish; suitable for exposed applications; and stretcher leveled or roller leveled to stretcher-leveled flatness.
- B. Stainless-steel sheet: ASTM A 666, Type 302 or 304, stretcher leveled, No. 4 finish.
- C. Epoxy resin composite: Factory formed under high temperature and pressure form cellulose fiber-reinforced epoxy resins with a pigmented, chemical-resistant, melamine-resin surface.
 - 1. Physical properties: Comply with the following requirements.
 - a. Flexural strength: 14500 psi.
 - b. Compressive strength: 24,000 psi.
 - c. Hardness (Rockwell M): 95.
 - d. Water absorption (24 hours): 1 percent (maximum).

- e. Heat distortion point: 350 deg. F.
 - f. Thermal-shock resistance: Highly resistant.
2. Flame spread: 25 or less per ASTM E 84.
 3. Chemical resistance: Composite material has the following ratings when tested with indicated reagents according to NEMA LD 3, test procedure 3.9.5:
 - a. Acetone: Moderate effect.
 - b. Hydrochloric acid (37 percent): No effect.
 - c. Hydrofluoric acid (50 percent): No effect.
 - d. Nitric acid (70 percent): No effect.
 - e. Perchloric acid (70 percent): No effect.
 - f. Phosphoric acid (85 percent): No effect.
 - g. Sulfuric acid (33 percent): No effect.
 - h. Carbon tetrachloride: No effect.
 - i. Ethyl acetate: No effect.
 - j. Furfural: No effect
 - k. Naphtha: No effect.
 - l. Toluene: No effect.
 - m. Ammonium hydroxide (28 percent): No effect.
 - n. Sodium hydroxide (50 percent): Moderate effect.
 - o. Zinc chloride: No effect.
 - p. Gentian violet: No effect.
 4. Glass-fiber cement board: ¼ inch thick glass-fiber cement board complying with ASTM C 1186.
 5. Tempered glass: ASTM C 1048, Kind FT, Condition A, Type 1, Class 1, Quality q3.
 6. Laminated safety glass: ASTM C 1172, Kind LT, Kind FT, Condition A, Type 1, Class 1, quality q3 lites with clear polyvinyl butyral interlayer.

2.3 STEEL-FRAMED FUME HOODS

A. General:

1. VAV type restricted bypass fume hoods.
2. Sash styles:
 - a. Bench hoods: Combination sash, with four horizontally sliding panels which can also be all raised vertically
 - b. Walk-in hoods: With three-panel framed horizontal sash.
3. Bypass: 20% of maximum face opening.
4. Prewired and prepiped; preassembled to greatest degree possible. All factory-installed plumbing, piping and electrical work shall be of materials and installation as specified in Divisions 15 and 16.
5. Pre-wiring: Lights, light switches and receptacles shall be prewired to a junction box on the top rear of the fume hood superstructure.

B. Construction:

1. Frame: Rigid steel structure.
2. Walls:

- a. Ends: Double wall 0.0478-inch steel sheet, four inches thick maximum without projections or obstructions to air flow.
 - b. Front vertical fascia:
 - 1) Full outside 135-1/2 degree radius from end walls.
 - 2) Contained space for service fittings.
 - 3) Flush with interior end panels and sash track.
 - c. Cord sleeves:
 - 1) Provide sleeves through both side walls allowing electrical cords to be routed from hood interior to receptacles on exterior face.
 - 2) Sleeve diameter sufficient to permit passage of multiple cords and plugs.
 - 3) Sleeve material to match liner.
3. Air foil:
- a. Providing nominal one-inch open space between foil and top front work surface edge.
 - b. Extending under sash, so one-inch opening is not closed.
 - c. Removable
 - d. 12 gage stainless steel.
 - e. Bench hood may have top and bottom airfoil; walk-in hood may have only top airfoil.
4. Top Panel:
- a. Matching fascia.
 - b. With integral vision panel directly above sash providing clear view of hood interior for 35 inches of height above work surface.
5. Baffles:
- a. Provide baffle system that permits not more than a 10% face velocity variation when tested according to ASHRAE 110.
 - b. Removable for cleaning.
 - c. Operating smoothly, have positive detent positions and move uniformly across the width of the hood.
 - d. Quantity: Three. (Four for low bench and walk-in style.)
 - e. Material: Same as that forming liner.
6. Duct collar:
- a. Stainless steel, 18 gage minimum.
 - b. One for 4-foot and 6-foot hoods, two for 8-foot hoods.
7. Lighting:
- a. Provide fluorescent light fixture with T8 lamps providing 80 foot-candles minimum on work surface. Provide fixtures, which carry UL, label.

- b. Vapor sealed from hood interior with ¼ inch thick laminated glass and chemical resistant rubber gaskets.
 - c. Switched on front face of hood.
 - d. Serviceable from hood exterior through “no-tools” access panel located below ceiling.
8. Sash:
- a. ¼ inch frameless laminated safety glass with chemical resistant gasket.
 - b. Counter balanced with sash weights and stainless steel cables, or chain and sprocket operation.
 - c. Full-length bottom metal handle.
 - d. Track: PVC flush with liner panels.
 - e. Provide sash stops to limit travel to 50% of full height unless manually overridden. Provide sash stops to limit vertical travel to below indicated ceiling heights.
 - f. Provide rubber bumpers top and bottom.
9. Plumbing services:
- a. Remote control valves located within end panels, controlled from face of hood, with color-coded plastic handles and trim.
 - b. Steam, compressed air and cold water valves: Stainless steel needle and seat type with replaceable seats.
 - c. Argon and nitrogen: Fine control valve.
 - d. Natural gas: Ball valve.
 - e. Cold water fixture: Gooseneck with vacuum breaker, serviceable from hood exterior. Vacuum breaker installed outside hood interior. Aspirator as specified in Division 22.
 - f. Interior exposed fittings: Angle serrated type, coated with acid and solvent resistant finish.
10. Electrical services:
- a. Place GFI receptacles on exterior. If space does not permit, place some receptacles in base cabinet fascia. Refer to Division 26 section WIRING DEVICES for specific requirements.
 - b. Light switch, 20A, and 125V, grounded on vertical exterior face.
11. Work surface and cabinet countertop:
- a. Black epoxy resin in accordance with Division 12 Section METAL LABORATORY CASEWORK”.
 - b. Dished 3/8-inch minimum with six-inch wide front ledge.
 - c. With cup sinks as required, and 3/8 inch high (minimum) curbed penetrations for acid and solvent cabinet vents and vacuum lines. Alternatively, extend and seal ventilation sleeve above work surface to form curb.
 - d. Provide sidewall cup sinks and black epoxy resin removable work shelf with raised front lip for walk-in hoods.
12. Base Cabinets: Comply with requirements of Division 12 Section METAL LABORATORY CASEWORK.

13. Access panels:
 - a. Directly adjacent to valves, provide interior panels not requiring tools for removal for access to valves and piping.
14. Dimensions:
 - a. Interior working height:
 - 1) Bench style: 42 inches minimum.
 - 2) Walk-in style: 78 inches minimum.
 - b. Interior depth: 25 inches minimum clear to rear; 18 inches clear minimum to lattice bars.
 - c. Sash opening: 28 inches minimum.
15. Liner:
 - a. ¼ inch thick non-metallic chemical resistant epoxy resin
 - b. Neutral/white color.
16. Controls:
 - a. Fume hood monitor and zone presence sensor will be furnished by the laboratory control supplier and installed by the fume hood manufacturer.
17. Lattice bars: (Standard in Chemistry facilities only.)
 - a. ½ inch stainless steel rods at 10 inches maximum on center each way, complete with rod clamps anchored to walls and countertop.
 - b. Nominal width: Side to side.
 - c. Nominal height: Countertop to top baffle (bench style). Floor to top baffle (walk in style).
 - d. Provide four-inch clearance from hood back panel to lattice bars assembly.
18. Finish: Clean and coat hood assembly with vapor and corrosion resistant finish system.
19. Ceiling enclosures:
 - a. Sized to fit unit, of matching materials.
 - b. Field fabricate to underside of ceiling
 - c. Provide light access panel not requiring tools for removal.

2.4 CYLINDER SUPPORTS

- A. Perma-Green Unistrut or equal, anchored to casework.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas for compliance with requirements for installation tolerances and other conditions affecting performance of fume hoods.
 - 1. Coordinate with installation of utilities.
 - 2. 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. Remove all packing material. 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 METAL LABORATORY CASEWORK for installing fume hood base cabinets, countertops, and sinks.

3.3 FIELD QUALITY CONTROL

- A. Provide AI testing according to ASHRAE 110 by an independent qualified contractor, witnessed by the owner's representative. Test at least 50% of each type of fume hood installed.
 - 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 for the project. If tested hoods fail to perform, field test additional hoods as directed by Architect.
- B. Noise generated by the functioning hood within 6 inches of the plane of the sash and by-pass opening in any position shall not exceed 60 dBA.

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. Balancing:
 - 1. Coordinate with and include hood controls supplier and installer in testing, adjusting and balancing work.
- C. 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 115313