

SECTION 11610 – HIGH PERFORMANCE LABORATORY FUME HOODS

PART 1 – GENERAL

1.1 DESCRIPTION

- A Furnish and install all high performance laboratory fume hoods as specified herein complete and ready for intended use.
- B All fume hoods to be Lab Crafters Air Sentry™ models. The concept of the Air Sentry™ High Performance Laboratory Fume Hood is to allow a fume hood to operate with up to 50% less exhaust air than a traditional hood but improving containment. The hood has a specially designed aerodynamic combination horizontal / vertical sash, specific modifications to the superstructure and an automatic positioning baffle to enhance containment. The Air Sentry™ fume hood incorporates integral controls, including baffle/slot control, to enhance containment based upon maintenance of the vortex roll within the hood, reacting to variables which could affect containment, including sash movement, hood loading, cross-drafts, personnel movement and other variables potentially affecting containment.

1.2 REFERENCES

- A Scientific Equipment and Furniture Association, SEFA 1-2005 Laboratory Fume Hoods
- B Scientific Equipment and Furniture Association, SEFA 8-1999 Laboratory Furniture, Casework, Shelving and Tables
- C Scientific Equipment and Furniture Association, SEFA 2.3-1997 Installation of Scientific Laboratory Furniture and Equipment
- D Underwriters Laboratories, UL 1805 Laboratory Hoods and Cabinets
- E American Society of Heating, Refrigeration and Air-conditioning Engineers, ANSI/ASHRAE 110-1995 Method of Testing Performance of Laboratory Fume Hoods
- F National Fire Protection Association NFPA 45 Flammable and Combustible Liquids Code 2000 Edition

1.3 SUBMITTALS

- A Product Data: Submit complete catalogue data, including a chart of manufacturer's standard finishes for all materials, equipment and products for work in this section.
- B Shop Drawings: Submit complete shop fabrication and installation drawings, including scaled plans, elevations, sections, details and schedules. Show relationship to adjoining materials and construction. Shop drawings shall not exceed 11 inches x 17 inches in size.
- C Test Reports: Submit complete reports verifying conformance to performance standards outlined in this specification when tested to the ASHRAE 110 Standard in the "As Manufactured" environment.

- D Operation & Maintenance Manuals: Provide complete written instruction manuals outlining safe operating procedures, safety guidelines, and proper maintenance procedures.
- E Operator Training Guide: Provide a VHS tape, CD-ROM or DVD-ROM with a training presentation, highlighting the proper operating practices of the laboratory fume hood.

1.4 PRODUCT HANDLING

- A Protection: Take necessary precautions to protect the work of this section before, during and after installation.
- B Coordination: Coordinate delivery and installation of laboratory fume hoods with that of the casework, plumbing and electrical work.
- C Project Conditions: Delivery shall take place when site conditions meet the guidelines outlined in SEFA 2.3-1997 Installation of Scientific Laboratory Furniture and Equipment, or most current published edition.

1.5 QUALITY ASSURANCE

- A Contractor for work in this section shall have an established organization and production facilities including all tools, equipment and special machinery necessary for specializing in the fabrication and installation of the type of products specified with skilled personnel, factory trained workmen and an experienced engineering department. Each shall have the demonstrated knowledge, ability and proven capability to produce the specified equipment of the required quality and the proven capacity to complete an installation of the size and scope of this project within the required time limits. A minimum of 10 years experience in the manufacture of laboratory fume hoods is required. A minimum of 5 years experience in the manufacture of high performance fume hoods is required. Manufacturer must have an installed population of at least 1000 high performance fume hoods installed and operating in the United States.
- B Source Limitations: Obtain laboratory fume hoods and the laboratory casework below the fume hoods through one source from a single manufacturer.
- C Product Standard (General): Comply with SEFA 1-2005, Laboratory Fume Hoods, or most current published edition.
- D Product Standard (Construction): All laboratory fume hood shall be Classified by Underwriters Laboratories under UL Standard 1805.
- E Product Standard (Performance): Achieve a performance rating of 4.0 AM 0.01 or better for all tracer gas tests conducted on all of the fume hood designs per the ASHRAE 110-1995 test, or the most current published edition.

PART 2 – PRODUCTS

2.1 LABORATORY FUME HOODS

- A Design Requirements:
- 1 Fume hoods shall function as ventilated, enclosed work spaces, designed to capture, confine and exhaust fumes, vapors and particulate matter produced or generated within the enclosure.
 - 2 Fume Hood shall operate safely with an average face velocity between 50 FPM and 60 FPM through the fully opened vertical sash. If the hood is installed on a VAV or a switched 2-state exhaust system, the hood shall operate safely with a face velocity of 60 FPM through the maximum horizontal sash opening.
 - 3 Design fume hoods for consistent and safe air flow through the hood face. Negative variations of face velocity shall not exceed 20 percent of the average face velocity at any designated measuring point as defined in this section.
 - 4 Average illumination of work area: Minimum 80 footcandles (860 lx). 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 (710 mm).
 - 5 Fume hood shall be designed to minimize static pressure loss with adequate slot area and bell shaped exhaust collar configuration.
- B Manufacturers: Subject to compliance with specified requirements, provide products by one of the following:
- 1 Lab Crafters, Inc. (www.lab-crafters.com)
Ronkonkoma, NY
Phone: 631.471.7755
Email: info@lab-crafters.com
 - 2 Owner or Architect Approved Equal
- C Materials:
- 1 All materials shall be of the highest quality and appropriate for intended use.
- D Construction Features:
1. Superstructure:
 - a. Wall: For safety related to physical structural support superstructures shall be double wall type with outer wall of polyurethane-coated steel and the inner galvanized wall, covered with 1/4" thick chemically resistant white fiberglass reinforced polyester. The exterior shall be constructed of 18 gauge C.R.S. finished in reagent resistant catalytically activated polyurethane, color selected from manufacture's standard color chart by architect/lab planner. The interior wall shall be securely held in place with concealed fastenings with corrosion protection. Hoods shall be completely factory assembled to form a rigid, self-supporting structure.
 - b. Dimensions: Interior dimensions front and back and vortex chamber to be mathematically sized to support a Bi-Stable vortex.
 - c. Bypass: By-pass air is introduced below the sash through multi-channel slots in airfoil, when the sash is closed. Above sash bypass grilles are not acceptable due to their adverse effect upon the

maintenance of the vortex roll. All air shall enter the hood through the sash opening and through multi-vector slots below the sash.

- d. Ceiling closure panel: Minimum (18 gage) (1.2 mm) thick, finish to match hood.
2. Face Opening:
- a. The following requirements are to prevent reverse eddy airflow. Area surrounding sash opening to be rounded to create an aerodynamic configuration with side posts maximum 4.5" in width. Side posts to incorporate an airfoil design.
 - b. Air foil: A multi-vector airfoil bypass and dynamic turning vane shall be mounted behind the sash. This airfoil shall be attached via spring loaded pins to hood allowing swing-up for line cord access. Bottom foil to be constructed of steel with a chemical resistant powdercoat finish or stainless steel.
 - c. Removable: Hood front section shall be removable to facilitate the hood's access to its final location. Fume Hood front to include posts, tracks, sash with weight, pulleys, cable, foil, plumbing fixtures and pre-wired electrical fixtures. Fume hood front with sash and pre-wired electrical components, including the light box, are to be removable from hood body as a complete assembled one piece unit (only using quick disconnects for the cable components or electrical components).
3. Color selection of finishes by Owner's Representative.
4. Sash:
- a. Full view type with clear, unobstructed, side to side view of fume hood interior and service fixture connections.
 - b. Sash shall be aerodynamically designed construction with chemically resistant coating, combination style with both vertical and horizontal moving glass panels. Horizontal sliding sashes are on two tracks. Each panel must ride on top hung rollers supported from top rail only. The sash mechanism shall be so designed to allow it to move below the counter top. Maximum sash opening to be 28". An additional 7" high, clear glass panel integrated as part of Hood lintel shall maintain a clear vision height of 34" above countertop.
 - c. Counter balance system (Option 1): Single weight, pulley, cable, counter balance system shall prevent sash tilting and permit one finger operation at any point along full width pull. Design system to hold sash at any position without creep and prevent sash drop in the event of cable failure. Sash and counterbalance mechanism to be life cycle tested to withstand a minimum of 100,000 cycles without signs of fatigue. Open and close sash against rubber bumper stops. Sash cables shall be Stainless steel, 1/8 inch (3 mm) diameter, 7x19 strand. Pulley assembly for sash cable: 2 inch (48 mm) diameter, nylon construction, ball bearing type, with cable retaining device.
 - d. Counter balance system (Option 2): Dual weight, chain and sprocket, counter balance system shall prevent sash tilting and permit one

finger operation at any point along full width pull. Design system to hold sash at any position without creep and prevent sash drop in the event of cable failure. Sash and counterbalance mechanism to be life cycle tested to withstand a minimum of 100,000 cycles without signs of fatigue. Open and close sash against rubber bumper stops. Chain style ANSI number 35; roller pitch 0.2000".

- e. Sash glass: 1/4 inch thick laminated safety glass.
5. Liners:
- a. Fiberglass reinforced polyester, 1/4" thick. Color: white. These panels to have at least a "Laboratory Grade finish" when tested per the chemical spot test in the Scientific Equipment and Furniture Association (SEFA) SEFA 8-1999 Standard. Chemical resistance test data to be supplied to the Owner for his evaluation for intended use, upon Owner request.
6. Baffles:
- a. Chemically resistant powder coated aluminum, automatically adjusting baffle with slots at top, center and bottom to include automated baffle controls unless otherwise indicated. Baffle control to maintain vortex and containment with sash movement, cross drafts and other factors. See "Baffle Controls/Alarm Systems" section for more information on baffle actuator. Chemical resistance test data on baffle coating to be supplied to the Owner for his evaluation for intended use, upon Owner request.
7. Work Surfaces:
- a. Epoxy resin, 1" thick. Color: Black
 - b. 1/4" Raised edge on the entire perimeter of the countertop creating a dished work area
8. Lighting:
- a. Fixture: 2 lamp, rapid start, UL listed fluorescent light fixture with sound rated ballast installed on exterior of fume hood roof. Provide safety glass panel sealed to the hood roof.
 - b. Interior of fixture: White, high reflecting plastic enamel.
 - c. Size: Largest possible up to 48 inches (1.2 m) for hoods with superstructures up to 6 feet (1.8 m). Provide two (2) 36 inch (0.9 m) fixtures for hoods with 8 foot (2.4 m) superstructures.
 - d. Lamps not included with fixtures.
 - e. Illumination: Minimum 80 footcandle (860 lx)
9. Electrical Power:
- a. Three wire grounding type receptacles, as indicated on the Drawings, rated at 120 VAC at 20 amperes.
 - b. Factory install receptacles, lighting, electrical fittings and wiring.
 - c. Pre-wire to a junction box located on hood roof for single point power connection.
10. Service Fittings and Piping:

- a. Hoods shall be factory pre-piped to a point of connection 2 inches (48 mm) above the hood roof. Pressure test all pre-piped lines in the factory.
 - 11. Exhaust Outlet:
 - a. Bell mouth exhaust collar sized per fume hood model number.
 - 12. Instruction Plate:
 - a. Silk-screened instructions on fume hood exterior with condensed information covering recommended locations for apparatus and accessories, use of sash, and recommended safe operating procedures.
 - 13. UL Label:
 - a. Clearly visible label affixed to hood front identifying fume hood as UL Classified. List the UL file number for verification of UL Classification.
- E. Americans with Disabilities Act Compliant Fume Hoods
- 1. Fume Hoods intended for use by operators with physical disabilities must be compliant with the ADA. Fume Hood must be mounted on nominal 29" high base cabinets. All service fixtures and controls should be mounted for easy reach from a seated wheel chair position. No control on the post shall be mounted higher than 20" from the fume hood work surface. No hood service in the hood shall be mounted deeper than 23" from the fume hood sash. Cabinet configuration below the fume hood shall have a minimum 36" wide knees space area for wheelchair access.
- F Baffle Control and Airflow Monitor:
- a. The Vortex Control System is a control system integral to the fume hood superstructure which includes baffle/slot control, to enhance containment based upon maintenance of the vortex roll with-in the hood reacting to variables which could affect containment including sash movement, hood loading, cross-drafts, personnel movement and other variables potentially affecting containment. Hood baffle shall incorporate three slots associated with an automated baffle positioning control to optimize slot velocity openings for maximum containment in response to variables potentially affecting containment. Containment as specified herein must be maintained. Baffle control system includes roof mounted baffle Actuator, Controller/Low Flow Alarm, and Sensor. Fume hood manufacturer shall provide and factory install the baffle control components for each fume hood indicated on the drawings. In addition to maintaining the vortex airflow pattern, the hood airflow monitor alerts the user when the average face velocity falls below Owner set point. Monitor must provide a digital readout of the velocity or an alpha text message of the hood condition, LED's indicating normal and alarm conditions and an audible horn when in alarm mode. The controller/monitor must have the ability to digitally communicate with a building automation system.

2.2 SOURCE QUALITY CONTROL TESTING OF FUME HOODS

- A. Submit a test report, for each type and size of hood, for the standard product previously tested, if the product is identical to equipment being provided for this project.
- B. Evaluation of standard product shall have been conducted in the manufacturer's test facility in accordance with the method prescribed in ANSI/ASHRAE 110-1995 or latest published edition. Hood test shall take place in the manufacturer's test facility with testing personnel, samples, apparatus, instruments, and test materials supplied by the manufacturer. Recommended gas analyzer is Infrared type device v. an Electron capture device. Test parameters shall deviate from the ASHRAE Standard in the following manner:
 - 1. For all tests, the mannequin's breathing zone shall be located 18" above the fume hood work surface.
 - 2. For all tests, the tracer gas release rate shall be 8.0 liters per minute.
 - 3. A Test shall be performed in the center position with simulated hood loading. Objects must be placed within the fume hood chamber, located even with the tracer gas ejector and behind the tracer gas ejector to simulate equipment and apparatus in the fume hood.
 - 4. A Test shall be performed in the center location with a walk-by challenge 24" behind the test mannequin for the duration of the test.
 - 5. A Test shall be conducted with a hotplate behind the tracer gas ejector set for 1000 watt output.
- C. Hoods shall achieve a rating of 8.0 AM 0.01 or better.

PART 3 EXECUTION

3.1 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.

3.2 ADJUSTING

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

3.3 CLEANING

- A. Clean equipment, touch up as required.

3.4 PROTECTION OF FINISHED WORK

- A. Provide all necessary protective measures to prevent damage to 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.

3.5 FIELD PERFORMANCE TESTING

- A. Manufacturer must have all fume hoods installed tested to current ASHRAE 110 Standard. Field test reports must be performed and prepared by an independent third party organization having no affiliation with the manufacturer. Results must indicate tracer gas performance ratings of 4.0 AI 0.05 or better for all tests. Manufacturer must have a representative on-site for all tests and must assist in trouble-shooting and correcting all non-conforming hoods.
- B. Person-as-Mannequin Test - This test is intended to simulate real-world laboratory conditions in which a real person manipulates real objects in the hood. This test is performed with the investigator standing in front of the ejector while repeatedly moving five objects from one side of the ejector to the other, then rotating the body away from the hood with the elbows next to the body and the arms horizontal in front. This series of movements is repeated for the duration of the tracer gas test. The air sampling is performed with a sampling probe at the same height as the breathing zone of the mannequin. Results must indicate tracer gas performance ratings of 4.0 AI 0.10 or better for all tests.
- C. Testing Contractor to provide a complete report of the results of the testing program including an executive summary, an outline of the test procedures and equipment used, a table of the results of each test conducted on each hood and a conclusion and recommendation section discussing the results and (if necessary) recommendations to improve fume hood performance.

3.6 TRAINING

- A. Upon completion of the installation of the fume hoods, Manufacturer must conduct a training seminar for the Owner's users at the job site discussing proper operation of the fume hood, fume hood features and best use practices. Training session must be at least one hour in length, not including a question and answer session. Training session must be scheduled within 30 days on completion of the installation.

3.7 WARRANTY

- A. Manufacturer must offer a minimum three-year warranty on parts and labor to fix defects in materials and workmanship for fume hoods and casework.

END OF SECTION