

SECTION 11610 - LABORATORY FUME HOODS AND RELATED PRODUCTS

PART 1 : DESCRIPTION OF WORK

1.00 SUMMARY AND SCOPE

A. Section Includes:

Based on **Labscape™ (Perchloric) Millennia Series** fume hood design, furnish and install all fume hoods, work tops, and understructures. Furnishing and installing all filler panels, knee space panels and scribes as shown on drawings.

B. Accessorization:

1. Furnishing and delivering all service outlets, accessory fittings, electrical receptacles and switches, as listed in these specifications, equipment schedules or as shown on drawings. Fittings attached to the fume hood superstructure shall be mounted at the factory.

C. Removal of all debris, dirt and rubbish accumulated as a result of the installation of the fume hoods to an on-site container provided by others, leaving the premises clean and orderly.

D. Related Divisions:

1. Division 12: Laboratory Casework
2. Division 15: Plumbing and Exhaust Ducting
3. Division 16: Electrical Fittings and Connections

E. Related Publications:

1. ASHRAE Standard 1 10.1995 - Method of Testing Performance of Laboratory Fume Hoods
2. NSF STD#49 - Photometric Method of Testing
3. NIH03-1 12C - National Institute of Health Specification
4. UL 1805 - Underwriters Laboratories Fume Hood Classification
5. ASTM D1875 - Bending Test
6. NFPA-45 - National Fire Protection Association

1.01 BASIS OF WORK

A. It is the intent of this specification to use **Labscape™** as the standards of construction for laboratory fume hoods. The construction standards of the **Labscape™ (Perchloric) Millennia** product line shall provide the basis for quality and functional installation.

B. Supply all equipment in accordance with this specification. The offering of a product differing in materials and construction from this specification requires written approval. This approval must be obtained seven (7) days before the proposal deadline. Procedures for obtaining approval for an alternate manufacturer are defined in section 2.00 C. in this specification.

C. General Contractors should secure a list of approved fume hood manufacturers from the architect as a protection against non-conformance to these specifications.

D. The owner/architect reserves the right to reject qualified or alternate proposals and to award based on product value where such action assures the owner greater integrity of product.

E. Submittals:

1. Manufacturer's Data: Submit manufacturer's data and installation instructions for each type of fume hood. Provide data indicating compliance with ASHRAE Standard 110 1995.

2. Shop drawings. Submit the following:

a. Shop Drawings:

Submit shop drawings for fume hoods showing plans, elevations, ends, cross- sections, service run spaces, location and type of service fittings:

- 1) Coordinate shop drawings with other work involved.
- 2) Provide roughing-in drawings for mechanical and electrical services when required.
- 3) Provide face opening, air volume, and static pressure drop data.

1.02 STANDARD FUME HOOD PERFORMANCE REQUIREMENTS

A. Fume hoods shall be of complete radio isotope design to insure maximum operating efficiency. A rear baffle system shall minimize turbulence in the upper portion of the hood interior.

B. Standard Fume Hood Types (*Millennia* Perchloric):

1. Open Bypass:

The hoods shall be of the bypass type. The fume hood design shall allow for automatic air bypass above the sash opening. The bypass shall limit the maximum air velocity through the face of the hood and provide for a constant volume of air through the hood regardless of sash position. The bypass shall control the increase in face velocity as the sash is lowered to limit the maximum velocity to not more than three and one-half, times the velocity with the sash full open.

C. Containment

1. Purpose:

The purpose of this specification is to prequalify the performance of the bidder's laboratory fume hood before award of contract. At his option, the owner or his representative may require the same tests to be performed and the same performance be achieved before acceptance of the hood after award of contract. The owner or his representative shall witness the tests. Failure to meet the performance specified shall be cause for rejection of the bidder. The manufacturer is to certify that the hoods to be supplied meet the following criteria:

2. Test Method:

The hood has been tested per the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Standard 110-1995 (or latest version) and by the Auxiliary Air Capture Test (Auxiliary Air hoods only).

3. The test facility shall meet the following requirements:

- a. The test facility shall have sufficient area so that a minimum of 5 feet of clear space is available in front of and on both sides of the hood for viewing tests.
- b. The facility's ventilation system shall have adequate heating and air conditioning so that room air temperatures can be maintained within the desired ranges.
- c. Room air currents in the test area shall be less than 20 FPM.
- d. The hood exhaust system shall be properly calibrated so that the desired exhaust air volumes can be easily attained.

4. Instrumentation, Equipment and Test Personnel:

Qualified personnel to have performed the tests.

Instrumentation and equipment required shall be supplied by the bidder at his expense. Required instrumentation includes but is not limited to the following items:

- a. Thermal anemometer capable of measuring air velocities from 10 to 600 ft./minute
 - b. Three dozen one-half minute smoke candles
 - c. Four ounces of Titanium Tetrachloride F
 - d. Supply of cotton throat swabs
 - e. Leakmeter 120 calibrated to indicate concentration of sulfur hexafluoride or equivalent
 - f. Flowmeter - 150 mf/minute capacity
 - g. Flowmeter - 15 L/minute capacity
 - h. Four gas sampling bags - 8 liter capacity
 - i. Two vacuum pumps - 1 CFM capacity
 - j. Two flow regulating valves
 - k. Two size 3 tanks of sulfur hexafluoride with a two-stage regulator or other tracer gas suitable for detector to be used
 - l. Three-way gas valve
 - m. Mannequin, 5'7" in height, or reasonable human proportions with arms hanging at its side
 - n. ASHRAE 110-1995 tracer gas ejector
5. ASHRAE Standard 110-1995 Test: Hood shall be tested with a face velocity of 100 FPM full open vertically and at 100 FPM right, left and center 100% open horizontally. If horizontal openings are present, additional sash configurations and face velocities may be specified. The hood shall have a performance rating of 4.0 AM 0.01 or better wherein:
- 4.0 = tracer gas release in liters/minute
AM = as manufactured
0.01 = level of control of tracer gas in parts per million (ppm).

1.03 QUALITY ASSURANCE

- A. Manufacturer shall have at least (10) years experience manufacturing projects of similar size and complexity.
- B. General Performance: Provide certification that fume hoods meet the performance requirements described in section 1 .02.C.

PART 2 – PRODUCTS

2.00 MANUFACTURERS

- A. The basis of this specification is the *Millennia* fume hood as manufactured by **Labscape™**.
- B. All laboratory equipment covered by the specification **shall be the product of one**

manufacturer to assure shipping continuity and single-source responsibility. All quotations from a manufacturer other than Labscape™ shall contain a review of the following capabilities:

1. List of shop facilities
 2. List of engineering and manufacturing personnel
 3. Proof of financial ability to fulfill the contract
 4. List of a minimum of ten installations over the last five years of comparable scope
 5. Proof of project management and installation capabilities
- C. The selected manufacturer must warrant for a period of one-year starting (date of acceptance or occupancy, whichever comes first) that all products sold under the contract referenced above shall be free from defects in material and workmanship. Purchaser shall notify the manufacturer's representative immediately of any defective product. The manufacturer shall have a reasonable opportunity to inspect the goods. The purchaser shall return no product until receipt by purchaser of written shipping instructions from the manufacturer.

2.01 MATERIALS AND CONSTRUCTION

A. Fume Hood Superstructure Frame:

A free-standing rigid frame structure of steel angle shall be provided to support exterior panels and interior liner and baffle panels. The exterior steel panels shall be removable without disassembly of the frame structure and inner liner.

B. Fume Hood Interior Walls:

Double wall ends, not more than 5" wide, shall be provided to maximize interior working area. The area between the double wall ends shall be closed to house the remote control valves. The front vertical fascia section shall have a full 135 degree at the front leading edge to provide a streamlined section and insure smooth even flow into the hood. The vertical fascias shall contain the required service controls, electrical switches and receptacles. The hood interior end panels and sash track shall be flush with the fascia to prevent eddy currents and back flow of air.

C. Fume Hood Airfoil:

A radiuses #316 stainless steel air foil shall be integral at the bottom of the hood opening. The foil shall provide a 1" open space between the foil and the top front edge of the work surface. The air foil shall extend back under the sash, so that the sash does not close the 1" opening.

D. Fume Hood Top Panel:

1 . Standard Grille Bypass Configuration:

The top front panel shall be of the same material as the exterior fascia. It shall have an integral grille stamped into the upper portion.

E. Fume Hood Baffles:

1. A stable, top-adjustable baffle with solid lower baffle shall be provided to aid in distributing the flow of air into and through the hood. The baffle shall be spaced out 2" from the back liner. The baffle shall be removable for cleaning.

F. Fume Hood Duct Collar:

1. A #316 stainless steel round duct collar shall be located in the top of the hood plenum chamber. Coated common steel duct collars are not acceptable. Mechanical trades shall supply duct transition piece, if necessary.

G. Fume Hood Lighting:

A two-tube T-12 standard or the optional T-8 fluorescent light fixture (bulbs included) of the size given below shall be provided at the top of the hood to give maximum light in the hood working area.

Hood Size, Ft.	Nominal Fixture Length, Ft.
4	3
5	4
6	4
8	2 (2 Fixtures)

The light fixtures shall be isolated from the hood interior by a 7/32" thick laminated safety glass panel sealed from the hood cavity. Fixture shall be UL labeled.

H. Fume Hood Sash :

1 . Vertical Sash:

A vertical rising sash with 7/32" laminated safety float glass shall be provided. The sash shall be #316 stainless steel with a full length integral handle at the bottom. The sash shall be counterbalanced with a single weight to prevent tilting and binding during operation. The sash track shall be black polyvinyl chloride set flush with the interior panels to minimize turbulence.

2. Vertical / Horizontal Rising Sash:

A vertical rising sash of four horizontally sliding 7/32" laminated safety float glass panel shall be provided. The sash shall have #316 stainless steel, fully welded stainless steel frame, with a full length integral handle at the bottom. The sash shall be counterbalanced with a single weight to prevent tilting and binding during operation. The sash track shall be black polyvinyl chloride set flush with the interior liner panels to minimize turbulence. Bench hoods shall have one sash in a single slotted sash track.

3. Sash Limiting Hardware:

A positive stop mechanical sash stop located at 18" open shall be fastened to the fume hood post and require manual override to raise the sash beyond operational level.

I. Fume Hood Plumbing Services:

- 1 . Plumbing services shall consist of remote control valves as selected located on the hood deck, controlled by extension rods projecting through the control panels of the base cabinet. Interior fitting for gases, vacuum and air shall be color coated panel flanges and angle serrated hose connectors. Interior fittings for cold water shall be color coated chrome. Interior fittings for distilled water shall consist of a bronze tin lined, white color- coded, panel flange and angle serrated hose connector. Interior fittings for steam shall consist of a cast bronze flange and angle serrated hose connector with a chemical resistant finish. Water goosenecks shall be cast bronze with a chemical resistant green finish. Hood shall be provided with an internal wash down located behind the upper baffle. Wash down is PVC material.

J. Fume Hood Electrical Services:

1. Electrical services shall be located in the understructure.

K. Hood Work Surface:

1. #316 stainless steel:

Hood work surface shall be integrated and includes a trough. The trough shall be flush with the recessed work surface and shall be provided with a 5% pitch.

L. Access Opening:

The overlap, non gasketed interior end liner panels shall be the same material as the liner.

Fume Hood Finish (**Urethane Powder-coat Process**)

All parts shall be completely finished with final matching finish, front, back, sides, inside and outside whether exposed to view or not. All finishing material resulting surfaces shall be uniform in color and gloss. Resulting finish shall be free of dirt and foreign matter. (a) Finish on Steel : All

metal work and steel pads shall be treated to resist corrosion and insure adhesion of the finished coats by the use of commercial applications of Bonderite or other equivalent protective coatings in a continuous conveyorized multiple spray type system followed by baking in a drying oven, for completed drying of steel before finishing. After surfaces have been prepared to receive finish, two coats of highest quality chemically resistant urethane baking enamel shall be applied and baked in high temperature baking ovens. The resulting finish shall have a smooth, hard, satin luster surface. Color shall be as specified and shall meet the following chemical surface tests with only slight dulling surface allowed.

ADHESION:

Test procedure: Two sets of eleven parallel lines 1 1/6 inch apart shall be cut with a razor blade to intersect at right angle thus forming a grid of 121 squares. The cuts are made just deep enough to go through the coating, but not into the substrate. They were then brushed lightly with a soft brush. They are examined with 100-foot candles of illumination.

Note: This test is based on ASTM D2197-68 standard Method of Test for Adhesion of Organic Coatings.

Test Evaluation: Adhesion shall be excellent.

HARDNESS:

Pencils are sharpened on emery paper to a wide edge. Pencils of creasing hardness are pushed across the paint film in a chisel-like manner until one is found that cut or scratched the film.

Test evaluation; The paint film has a hardness of 4H.

M. Fume Hood Paint Finish and Other Material Tests

1. Terms and Equipment

- a. Terms and equipment defined as required for Labscape™ steel paint system finish and performance specification evaluation.
- b. Specified Chemicals - This list is composed of reagents commonly used in the laboratories that purchase laboratory furniture.
- c. Watch Glass - Round, convex glass pieces designed for laboratory reagent testing. One inch and one and one-half inch sizes can be used.

One size per test panel is recommended for uniformity.
- d. Convex - Curved or rounded like the exterior of a sphere or circle, the curved side of a watch glass.
- e. Saturate - To load to capacity or fill completely.
- f. Cotton Balls - Approximately one cubic inch balls of cotton fiber, not sterilized, each weighing approximately 0.32 grams.

2. Performance Test Ratings:

The terms referred to in Performance Test Results follow.

"Excellent" - indicates that the test leaves no visible effect on the finish film other than an increase in gloss.

"Good" - indicates that the testing leaves no effect other than slight discoloration, slight decrease in gloss or temporary slight softening of the finish film with no loss of adhesion and film protection.

*Temporary slight softening may exist upon reagent removal, but should be termed as failure only if the softened condition exists at the end of the one hour recovery period.

"Failures" - are indicated as objectionable discoloration or decrease in gloss, swelling, blistering, softening, or bared steel.

3. Performance Test Results >From Chemical Spot Tests:

- a. The test panel should be a suitable sized production piece finished as specified in Section 2.01 M.
- b. Prepare the test panel with labeled spaces for each of the twenty specified chemicals. Two by two-inch test spaces should be used.
- c. Chemical spot tests should be made by applying ten (10) drops (approximately 1/2 cc) of each reagent to the test surface. Each reagent should be covered with a watch glass, convex side down, in the center of the puddle to hold the reagent in place. Volatile solvents should be applied by using saturated one inch cotton balls, which are in turn, covered by inverted two ounce wide mouth bottles to retard evaporation. All spot tests should be performed in such a manner that the tested surfaces remain wet throughout the entire test period, at a temperature of 77 degrees F. plus or minus 3 degrees F.
- d. At the end of the test period, the test surface should be flushed with cold water and lightly scrubbed with a soft bristle brush and soapy water, then rinsed and dried before examination and evaluation.
- e. Test results are to be determined at the end of a one hour recovery period. Performance test ratings are to be determined as indicated in Section 2.01 N.2. (The test approximates the actual condition of a reagent bottle setting in a puddle of the reagent on a surface).

Reagents*	Time In Test	
	Minutes	Ratings
Acetic Acid, 98%	60	Good
Sulfuric Acid, 25%	60	Excellent

LAB FUME HOODS

11610-FH-

7

Sulfuric Acid, 85%	60	Good
Hydrochloric Acid 37%	60	Excellent
Nitric Acid, 25%	60	Excellent
Phosphoric Acid, 75%	60	Excellent
Perchloric Acid, 70%	60	Excellent
Methylene Chloride	60	Excellent
Sodium Hydroxide, 25%	60	Excellent
Sodium Hydroxide, 10%	60	Excellent
Ammonium Hydroxide, 28%	60	Excellent
Hydrogen Peroxide, 5%	60	Excellent
Ether	60	Excellent
Ethyl Alcoholic	60	Excellent
Ethyl acetate	60	Excellent
Xylene	60	Excellent

Acetone	60	Excellent
Formaldehyde, 37%**	60	Excellent
Carbon tetrachloride	60	Excellent
Methyl Ethyl ketone	60	Excellent

* Where concentrations are indicated, percentages are by weight.

** Volatile solvents, applied by saturated cotton ball method.

4. Bending Test:

An 18 gauge steel strip, finished as specified, when bent 180° over a 1/2" diameter mandrel, shall show no peeling or flaking off the finish.

5. Adhesion Test:

Ninety or more squares of the test sample shall remain coated after the scratch adhesion test.

Two sets of eleven parallel lines 1/16" apart shall be cut with a razor blade to intersect at right angles thus forming a grid of 100 squares. The cuts shall be made just deep enough to go through the coating, but not into the substrate. They shall then be brushed lightly with a soft brush. Examine under 100 foot candles of illumination.

6. Hardness Test:

The test sample shall have a hardness of 4-H using the pencil hardness test. Pencils, regardless of their brand, are valued in this way: 8-H is the hardest, and the next in order of diminishing hardness are 7-H, 6-H, 5-H, 4-H, 3-H, 2-H, F, HB, B (soft), 2-B, 3-B, 4-B and 5-B (the softest).

The pencils shall be sharpened on every paper to a wide sharp edge. Pencils of increasing hardness shall be pushed across the paint film in a chisel-like manner until one is found that will cut or scratch the film. The pencil used before that one—that is, the hardest pencil that will not rupture the film—is then used to express or designate the hardness.

O. Fume Hood Dimensions

Interior clear working height shall be not less than 35-1/2" at any location in the interior of the hood on bench hoods and 76" on walk-in and distillation hoods. Interior depth from the back of the sash to the front of the rear baffle shall not be less than 22-3/4". The sash opening shall be not less than 30" in height above the work surface on bench hoods and 60" on walk-in and distillation hoods.

P. Fume Hood Liners

1. A coved #316 stainless steel with integral counter top shall be supplied. A seamless, with all welds ground smooth shall be incorporated. Finish shall be #4.

Q. Fume Hood Base Cabinets

1. Standard Steel

- Unless otherwise indicated base units under hoods shall be fabricated of cold rolled prime grade roller leveled furniture steel. Gauges of steel used in construction shall be 18 gauge except as follows:
- Corner gussets for leveling bolts and apron corner braces, 12 gauge.
- Hinge reinforcements, 14 gauge.
- Top and intermediate front horizontal rails, apron rails and reinforcement gussets, 16 gauge.
- Door assemblies and adjustable shelves, 20 gauge.
- Performance of the painted surfaces shall match that of the fume hood outer panels.

2. Special Purpose Cabinets for use under Fume Hoods:

- Acid Storage Cabinets:

Where indicated acid storage cabinets shall use the same gauges of steel and construction features as other base cabinets. In addition, they shall have a polyresin lined interior. Each door will have a set of louvers at the top and bottom. The door shall be lined with a polyethylene sheet. Each cabinet shall be vented into the fume hood with a 1-1/2" vent pipe, providing a positive airflow directly into the fume hood exhaust system.

b. Solvent Storage Cabinets:

Solvent storage cabinets shall be built in accordance with NFPA and OSHA guidelines and specifically designed for the storage of flammable and combustible liquids. Construction shall be based upon the requirements listed by UFC, OSHA, and NFPA No. 30 - 1993. The bottoms, top, sides and doors shall be fabricated of 18" gauge steel and shall be all double panel construction with a 1-1/2" air space between panels. All joints shall be welded, or screwed, to provide a rigid enclosure. The doors shall swing on full-length stainless steel piano hinges and shall be fully insulated. The right hand door shall be equipped with a three point latching device and the left-hand door shall have a full height astragal. The doors are self-closing and synchronized so that both doors will always fully close. The right hand door is equipped with a three-point latching system that automatically engages when the doors close. Each door is equipped with a fusible-link hold-open feature that will ensure the door closes should the temperature outside the cabinet exceed 165 degrees Fahrenheit. Units 24" long have only one door, self-closing, and equipped with a three-point latching system and hold-open feature. A 2" deep liquid tight pan that covers the entire bottom of the cabinet shall be furnished to contain liquid leaks and spills. A full-depth adjustable shelf is also provided. The shelf is perforated to allow air circulation within the cabinet. Two diametrically opposed vents with spark screens are provided in the back of the cabinet as well as a grounding screw. The cabinet shall have interior finish same as exterior. The cabinet shall be labeled: "FLAMMABLE – KEEP FIRE AWAY".

R. Accessories:

1 . Filters and Housings:

Where called for, a filter housing shall be provided above the hoods. The housing shall contain an absolute filter (99.97% efficient for 0.3 micron particles) and a furnace type prefilter. The housing shall form a rigid, self-supporting assembly and have a casketed front cover to allow replacement of the filters without disturbing the ductwork. The filter housing shall be fabricated of cold rolled steel with a chemical resistant finish.

2. Alarm

a. Digital Face Velocity Alarm System:

Fume hoods shall be provided with an alarm system to detect low and high hood face velocities. The alarm system shall indicate the actual face velocity of the hood regardless of sash position. The system shall have an air velocity sensor mounted on the interior side

liner of the hood where it is easily accessible for cleaning. The velocity monitor shall have a digital display of the air velocity through the hood face in feet per minute. The alarm signals shall activate any time the face velocity falls below the low velocity alarm set point or rises above the high velocity alarm set point.

There shall be both visual and audible alarm signals. The audible alarm shall have a mute. Low and high alarm contacts shall be provided for remote monitoring.

PART 3 – EXECUTION

3.00 SITE EXAMINATION

The fume hood supplier/installer shall certify building conditions conducive to the installation of a finished goods product, including all critical dimensions.

3.01 INSTALLATION

A. Preparation:

Prior to beginning installation of fume hood, check and verify that no irregularities exist that would affect quality of execution of work specified.

B. Coordination:

Coordinate the work of the Section with the schedule and other requirements of other work being performed in the area at the same time both with regard to mechanical and electrical connections to and in the fume hoods and the general construction work.

C. Performance:

Install fume hoods, plumb, level, rigid, securely anchored to building and adjacent furniture in proper location, in accordance with manufacturer's instructions and the approved shop drawings. Provide filler panels between top of hood and ceiling. Securely attach access panels but provide for easy removal and secure reattachment. Do not install any damaged units.

D. Adjust and Clean:

1. After installations are complete, adjust all moving parts for smooth operation.
2. Remove all packing materials and debris resulting from this work, and turn over the fume hoods to the Owner clean and polished both inside and out.
3. Repair or remove and replace defective work, as directed by owner and/or his representative upon completion of installation.

E. Protection:

1. Provide reasonable protective measures to prevent casework and equipment from being exposed to other construction activity.
2. Advise owner and/or his representative of procedures and precautions for protection of material, installed laboratory casework and fixtures from damage by work of other trades.

F. Certification:

1. H.V.A.C. contractor shall field test a random sample of 20% of the installed units using ANSI/ASHRAE 1 10-1995 to a control level of AI 0.01 ppm or better.
2. Project substantial completion shall be withheld until all required fume hood certification letters, tests, and reports have been submitted to and approved by the Architect.