SECTION 11610.2

ISOLATOR^2 SERIES LABORATORY FUME HOODS

PART 1 GENERAL

1.00 SUMMARY

A. Section Includes:
   1. Laboratory Fume Hoods

B. Related Sections:
   1. Section 12345 – Steel Laboratory Casework: Base units and work surfaces for fume hood/base unit assembly.
   2. Section 12346 – Flex Laboratory Furniture System.
   3. Section 15975 – Smart Sash
   3. Division 15: Furnishing and installation of plumbing utilities and final connections to fume hoods.
   4. Division 15: Furnishing and installation of exhaust duct work and equipment, and final connection of fume hoods.
   5. Division 16: Furnishing and installation of electrical utilities and final connections to fume hoods.

C. Reference Standards:
   1. UL 1805 – Standard for Laboratory Fume Hoods and Cabinets
   2. ANSI/ASHRAE 110-1995 – Method of testing Performance of Laboratory Fume Hoods
   3. CSA Z316.5-04 – Fume Hoods and Associated Exhaust Systems

1.01 FUME HOOD GENERAL DESIGN REQUIREMENTS

A. All fume hoods covered in this section are ***Isolator^2*** Series with a top and bottom airfoil and aerodynamically shaped fascia posts to minimize turbulence. The design incorporates a restricted air bypass system so that the exhaust air volume is constant (CAV type). Bypass is recessed behind the plane of the sash and affords velocity tempering performance in CAV mode.

B. Fume hoods shall be designed for consistent and safe air flow through the hood face. Negative variations of face velocity shall not exceed 20% of the average face velocity at any designated measuring point as defined in this section.

C. Average illumination of work area: minimum 80 foot-candles. 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 48 inches.

D. Fume hood shall be designed to minimize static pressure loss with stainless steel round duct collar configuration. Maximum average static pressure loss readings taken three diameters above the hood outlet from four points, 90 degrees apart, shall not exceed the following maximums:

Face Velocity at sash full open- measured S.P.L. (W.G.)

24” vertical open	60 F.P.M.	.06 inches
18” vertical open	80 F.P.M.	.04 inches
50% horizontal open Vertical closed	100 F.P.M.	.02 inches

E. Fume hood shall maintain essentially constant exhaust volume at any baffle position for safety. Maximum variation in exhaust CFM, static pressure and average face velocity as a result of baffle adjustment shall not exceed 5% for any baffle position at the specified face velocity.

1.02 SUBMITTALS

A. Submit manufacturer's test data and installation instructions for each type of fume hood. Provide data indicating compliance with ANSI/ASHRAE Standard 110-1995.

B. Provide samples of the following:
1. 6" x 6" section of the interior fume hood liner material.
2. 12" x 12" section of countertops with dish formation.
3. Color samples of manufacturer's finish.
4. Hardware and accessories including sample sash handle and/or pulls, chains, axles, and sprockets.

NOTE: Samples of the approved manufacturer will be kept at the job site or the office of the architect until completion of the project.

C. Provide submittal drawings for fume hoods showing plans, elevations, sections and service run spaces. Details shall include notation of all specified items.
1. Provide location and type of service fittings as related to the fume hood when required.

2. Provide roughing-in drawings for mechanical and electrical services as related to the fume hood when required.
3. Provide face opening, air volume and static pressure drop data.

1.03 FUME HOOD PERFORMANCE REQUIREMENTS – See APPENDIX A

PART 2 PRODUCTS

2.00 MANUFACTURER

A. Laboratory Fume Hoods and related equipment designed and manufactured by: Jamestown Metal Products LLC, 178 Blackstone Avenue, Jamestown, New York, 14701.

2.01 MATERIALS

A. Typical sheet steel used in the construction of fume hoods:
1. Mild carbon, cold rolled and leveled unfinished steel
2. Type 304 or 316 stainless steel, #4 finish one side
3. Mild carbon, cold rolled and hot dipped galvanized steel

B. Typical gauges:
1. Stainless steel: 12, 14, 16, 18 and 20 GA
2. Mild Steel: 18 GA
3. Galvanized steel: 18 GA

C. Sash glass:
1. ¼" clear laminated glass (standard)
2. ¼" clear tempered glass (optional)

D. Sash tracks: Corrosion-resistant polyvinyl chloride (PVC).

E. Fastening devices:
1. Interior surfaces: Nylon bolts, PVC fasteners, PVC-capped 410 stainless screws
2. Exterior structural members: 410 stainless steel screws
3. Exterior panel members: #8-32 zinc plated screws

F. Interior liners: The liner consists of all interior surfaces, including sides, top, back and baffles. See **APPENDIX B** for liner performance requirements.
1. Standard: Fiberglass reinforced polyester material (polyglass), ¼" nom. thickness, white

2. Optional liner materials:
   a. Type 304 stainless steel, 16 GA, #4 finish
   b. Type 316 stainless steel, 16 GA, #4 finish
   c. PVC plastic sheet, ¼" nom. thickness, white
   d. Polypropylene plastic sheet, ¼" nom. thickness, white
   e. Composition stone, ¼" nom. thickness, light grey

2.02 FUME HOOD CONSTRUCTION – BENCH HOODS

A. Superstructure: Shall consist of 18 gauge galvanized steel side pans, maximum 4-3/4" thick, holding side and rear liner panels, and fastened together with pinions and screws so that the entire structure is secure and rigid. Any framing system not providing structural support is unacceptable. Front and both sides of the superstructure are aligned and precision fit, eliminating the need for exterior gaskets.

B. Airfoils:
   1. Lower airfoil: Shall be constructed of 14 gauge 304 #4 finish stainless steel, is flush to the work surface and incorporates an integral containment trough. Two-inch diameter cord pass-throughs are located on each fascia post. These pass-throughs shall allow sash handle to seal against airfoil without running cords and tubes under the airfoil, but by simply resting cords and tubes into the pass-through cavity.
   2. Upper airfoil ***(Specifier's Option – choose one)***:
      a. 18 GA mild steel and painted (standard)
      b. Type 304 stainless steel, #4 finish (optional)

C. Sash ***(Specifier's Option – choose one)***:
   1. Provide a frameless vertical sash containing a 1/4" (6 mm) laminated glass panel and a full width anodized aluminum aerodynamic wedge-shaped sash handle connected to a steel rear-hung counterweight system insuring non-tilting, non-binding, and non-creeping sash performance. Rear-mounted counterweight shall be connected to a #35 case-hardened steel chain engaging a twin sprocket axle system with positive master link connection points both front and rear. Sash systems utilizing cables and pulleys are not acceptable. Painted steel parts in the sash are not acceptable.
   2. Provide a combination sash with horizontal sliding panels no wider than 18". Standard sash elements are laminated glass panels set into an aluminum track housed within the stainless steel sash frame giving either horizontal or vertical movement options to the end user.

A steel rear-hung, counterweight system is used to insure non-tilting, non-binding, and non-creeping sash performance. Rear-mounted counterweight shall be connected to a #35 case-hardened steel chain engaging a twin sprocket axle system with positive master link connection points both front and rear. Sash systems utilizing cables and pulleys are not acceptable. Painted steel parts in the sash are not acceptable.

3. Provide a horizontal sliding sash consisting of a stainless steel top rail holding stainless steel framed glass panels and an aluminum bottom track. Standard sash elements are laminated glass panels set into an aluminum track housed within the stainless steel rail. Painted steel parts in the sash are not acceptable.
4. Provide a framed vertical sash containing a standard laminated glass panel set into a stainless steel frame connected to a steel rear-hung counterweight system insuring non-tilting, non-binding, and non-creeping sash performance. Rear-mounted counterweight shall be connected to a #35 case-hardened steel chain engaging a twin sprocket axle system with positive master link connection points both front and rear. Sash systems utilizing cables and pulleys are not acceptable. Painted steel parts in the sash are not acceptable.
5. Automatic Sash return option allows precise return of the sash from the full open position to the normal operating position. This latches the sash in the full open position with a spring-loaded detent. The sash will return to the normal operating position, slightly below the defeatable sash stops when the detent lever is moved to the left. As the sash is raised to the full open position a helical spring is placed in tension. The extended spring supplies sufficient energy to return the sash to the normal operating position without operator intervention, once the operator has released the detent.

D. Baffles: Control air vectors into and through the fume hood, and shall be fabricated of the same material as the liner. Provide three fixed baffles and one adjustable baffle at bottom.

E. Bypass: Isolator Viewpass system consisting of a ¼" thick clear laminated glass panel allowing complete visual display of fume hood interior.

F. Duct collars: 12" round exhaust outlet collar(s), fabricated of 20 gauge Type 304 stainless steel. Coated steel collars are not acceptable.

G. Fascia posts ***(Specifier's Option – choose one)***:
1. 18 GA mild steel and painted (standard)
2. Type 304 #4 finish stainless steel (optional)

H. Exterior end panels ***(Specifier's Option – choose one)***:
   1. 18 GA mild steel and painted (standard)
   2. Type 304 #4 finish stainless steel (optional)
   3. No end panels (optional)

I. Interior clearance: All bench type fume hoods are designed to have an interior vertical clearance of not less than 47" in the front twelve inches of the hood depth. Internal dimensions may be affected by accessories or options.

J. Interior lighting: Standard configurations for fluorescent light fixtures are: 36" hood (1-24" fixture); 48" hood (1-36" fixture); 60" hood (1-48" fixture); 72" hood (1-48" fixture); 96" hood (2-36" fixtures).

   (Specifier's Option – choose one):
   1. Standard hinged fluorescent light fixture configured for T-8 lamp tubes shall be provided and installed on the exterior of the fume hood roof. A tempered glass panel is provided and has a vapor-tight seal to isolate the fluorescent fixture from the hood interior. The largest possible double tube UL approved fixture is provided for each hood.
   2. Incandescent, explosion-proof 150 watt light.

K. Fluorescent Tubes or Incandescent Bulbs ***(Specifier's Option – choose one)***:
   1. Provided by others (standard)
   2. Included with fixture (optional)

L. Service Fittings and Fixtures:
   1. All laboratory service fittings and fixtures shall be as manufactured by the Water Saver Fixture Company or an approved equal. Fixtures, including handles, shall be color coded to indicate the proper service. Color code requirements for indexing service fixtures shall be as follows:

Service	Index Color
Gas	Blue
Air	Orange
Vacuum	Yellow
Steam	Black
Cold Water	Green
Hot Water	Red
Deionized Water	White
Other Services	On Application

   2. Finish of Service Fixtures:
      a. Laboratory service fixtures (except fittings inside the fume hood) shall have ***(Specifier's Option – choose one)***:

1. A polished chrome finish with clear epoxy coating (standard)
2. A satin chrome finish with clear epoxy coating (optional)

b. Fittings inside the fume hood shall have an epoxy finish color-coded to match the fixture service index color.

M. Electrical services ***(Specifier's Option – choose one)***:

1. Specified electrical outlets and switches are shipped loose for field installation by the electrical contractor. All electrical receptacles are 3-wire, 20 amp duplex, 120/277VAC or as specified. Light switch shall be 3-wire polarized grounded, 15 amp, 125VAC or as specified. Face plates are stainless steel.
2. Wiring harnesses shall be furnished for each specified fascia post mounted electrical device and field-installed.
3. Specified electrical services are prewired to a junction box located on the roof of the fume hood for field connection by the electrical contractor. All electrical receptacles are 3-wire, 20-amp duplex, 120/277VAC or as specified. Light switch shall be 3-wire polarized grounded, 15 amp, 125VAC or as specified. Face plates are stainless steel.

N. Work surfaces ***(Specifier's Option – choose one)***:

1. Epoxy resin, 1-1/4" thick, molded top made in the form of a watertight pan, not less than 1/4" deep to contain spillage. Work surfaces are non-glaring finish and black, grey or white in color (standard).
2. Type 304 stainless steel, 16 gauge, formed down, making a 1-1/4" high face, and dished to form a watertight containment not less than 1/4" deep to contain any spills within the fume hood (optional).

NOTE: See **APPENDIX C** for work surface performance requirements.

O. Instruction Plate: Corrosion resistant or plastic plate attached to the fume hood exterior with condensed information covering recommended locations for apparatus and accessories, use of sash and recommended safe operating procedures.

2.03 FUME HOOD CONSTRUCTION – WALK-IN HOODS

Walk-in hoods shall employ the same materials and construction methods as standard bench hoods with the following exceptions:

A. Hood roof: Shall be fabricated from the same liner material as the rest of the containment cavity as standard. If additional containment for accidental fire is desired, an optional 18 GA galvanized steel roof with liner material identical to that used in the rest of the containment cavity mounted to the interior is available.

B. Sash ***(Specifier's Option – choose one)***:

1. Provide two frameless vertical sashes, each containing a standard ¼" laminated glass panel and a full width anodized aluminum aerodynamic wedge-shaped sash handle connected to a steel rear-hung counterweight system insuring non-tilting, non-binding, and non-creeping sash performance. Rear-mounted counterweight shall be connected to a #35 case- hardened steel chain engaging a twin sprocket axle system with positive master link connection points both front and rear. Sash systems utilizing cables and pulleys are not acceptable. Painted steel parts in the sash are not acceptable.
2. Provide two sashes; the upper being a combination sash with horizontal sliding panels no wider than 18" and the lower being a framed vertical sash. Sash elements in the combination sash are laminated glass panels set into an aluminum track housed within the stainless steel sash frame giving either horizontal or vertical movement options to the end user. Sash elements in the framed vertical sash are a standard ¼" laminated glass panel set into a stainless steel frame connected to a steel rear-hung counterweight system insuring non-tilting, non-binding, and non-creeping sash performance. Rear-mounted counterweight shall be connected to a #35 case-hardened steel chain engaging a twin sprocket axle system with positive master link connection points both front and rear. Sash systems utilizing cables and pulleys are not acceptable. Painted steel parts in the sash are not acceptable.
3. Provide a horizontal sliding sash consisting of a stainless steel top rail holding stainless steel framed glass panels and a stainless steel bottom track. Sash elements are standard laminated glass panels set into an aluminum track housed within the stainless steel rail. Painted steel parts in the sash are not acceptable.
4. Provide two framed vertical sashes, each containing a standard ¼" laminated glass panel set into a stainless steel frame connected to a steel rear-hung counterweight system insuring non-tilting, non-binding, and non-creeping sash performance. Rear-mounted counterweight shall be connected to a #35 case-hardened steel chain engaging a twin sprocket axle system with positive master link connection points both front and rear.

Sash systems utilizing cables and pulleys are not acceptable. Painted steel parts in the sash are not acceptable.

C. Baffles: Control air vectors into and through the fume hood, and shall be fabricated of the same material as the liner. Provide four fixed baffles and two adjustable baffles at bottom.

D. Interior clearance: All walk-in type fume hoods are designed to have an interior vertical clearance of not less than 83" in the front twelve inches of the hood depth. Accessories or options may affect internal dimensions.

2.04 OPTIONAL FEATURES

A. Velocity alarm: Fume hoods shall be equipped with Jamestown-Tel fume hood velocity alarm to detect low hood face velocities. The units are surface-mounted on the hood's fascia panel. No control module, when mounted, shall be thicker than 1-1/2". The UL approved velocity alarm signals an unsafe operating condition when the fume hood face velocity falls below a preset amount. The alarm set-point calibration is performed by the user/owner once a proper face velocity has been set and measured. The alarm system consists of the following:

1. LCD digital display that registers face velocities between 0 and 1000 FPM plus a safety reference display that actuates in low velocity conditions.
2. Programmable alarm set point.
3. Audible alarm of at least 80 dB.
4. Flashing red warning light in synchronization with the audible alarm.
5. Silencer button for the audible alarm; flashing red light will continue to flash.
6. Optional 0-10VDC available to signal BAC.
7. Alarm system is furnished with velocity detector, 110V/12VDC power supply, and detector mounting hardware. The system operation at 110V, 60 Hz power.

B. Smart sash: See Section 15975 for details.

2.07 METAL FINISH (Painted Components)

A. Preparation: Metal shall be treated with a heated alkaline based acid solution, rinsed with water, and a coat of epoxy-link applied; immediately dried in heated ovens, then gradually cool prior to application of finish.

B. Application: Electrostatically apply a hybrid epoxy powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a chemical resistant, high grade laboratory furniture quality finish of the following thicknesses:
   1. Exterior and interior surfaces exposed to view: 1.5 mil average and 1.3 mil minimum.
   2. Backs of cabinets and other surfaces not exposed to view: 1.0 mil average.

C. Chemical Resistance :
   1. Test procedure: Place test panel on a flat surface, clean with soap and water and blot dry. Condition the test panel for 48 hours at 73°F ± 3°F and 50% ± 5% relative humidity. Panel will be subjected to chemical reagents according to SEPA 8/1999 Recommended Practice using one of the following two test methods:
      a. Method A – Test volatile chemicals by placing a cotton ball saturated with reagent in the mouth of a 1-oz. bottle and inverting the bottle on the surface of the panel.
      b. Method B – Test non-volatile chemicals by placing five drops of the reagent on the surface of the panel and covering with a 24 mm watch glass, convex side down.
      c. For both test methods, leave the reagents on the panel for a period of one hour. Wash off the panel with water, clean with detergent and naptha, and rinse with deionized water. Dry with a towel and evaluate after 24 hours at 73°F ± 3°F and 50% ± 5% relative humidity using the following rating system.

   2. Evaluation ratings: Change in surface finish and function shall be described by the following ratings:
      a. Level 0 – No detectable change.
      b. Level 1 – Slight change in color or gloss.
      c. Level 2 – Slight surface etching or severe staining.
      d. Level 3 – Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration.

3. Test Results:

REAGENT	METHOD	RATING
Acetate, Amyl	A	0
Acetate, Ethyl	A	1
Acetic Acid, 98%	B	1
Acetone	A	1
Acid Dichromate, 5%	B	0
Alcohol, Butyl	A	0
Alcohol, Ethyl	A	1
Alcohol, Methyl	A	1
Ammonium Hydroxide, 28%	B	0
Benzene	A	1
Carbon Tetrachloride	A	1
Chloroform	A	1
Chromic Acid, 60%	B	2
Cresol	A	1
Dichlor Acetic Acid	A	2
Dimethylformanide	A	1
Dioxane	A	1
Ethyl Ether	A	0
Formaldehyde, 37%	A	0
Formic Acid, 90%	B	3
Furfural	A	2
Gasoline	A	0
Hydrochloric Acid, 37%	B	1
Hydrofluoric Acid, 48%	B	1
Hydrogen Peroxide, 28%	B	0
Iodine, Tincture of	B	0
Methyl Ethyl Ketone	A	1
Methylene Chloride	A	1
Mono Chlorobenzene	A	0
Naphthalene	A	0
Nitric Acid, 20%	B	1
Nitric Acid, 30%	B	1
Nitric Acid, 70%	B	3
Phenol, 90%	A	1
Phosphoric Acid, 85%	B	0
Silver Nitrate, Saturated	B	1
Sodium Hydroxide, 10%	B	0
Sodium Hydroxide, 20%	B	0
Sodium Hydroxide, 40%	B	0
Sodium Hydroxide, Flake	B	0

Sodium Sulfide, Saturated	B	0
Sulfuric Acid, 33%	B	0
Sulfuric Acid, 77%	B	1
Sulfuric Acid, 96%	B	3
Sulfuric Acid (77%) & Nitric Acid (70%), (equal parts)	B	3
Toluene	A	0
Trichloroethylene	A	0
Xylene	A	0
Zinc Chloride, Saturated	B	0

Note: Manufacturer shall provide independent certified test report on chemical resistance of finish if requested.

2.08 QUALITY ASSURANCE

A. All laboratory fume hoods specified herein will be the product of one manufacturer and will be based on the specifications of the product line described in Part 2. All manufacturers other than those of the specified products will provide evidence of expertise in the manufacture of fume hoods and be willing to have their manufacturing facility scrutinized by the customer.

B. All manufacturers desiring approval for this project must maintain a fume hood test facility at their factory location. This facility must provide for variable exhaust and make-up air control. In addition, any facility that provides for fume hood make-up air by using floor-to-ceiling wall diffusers is unacceptable. All qualified test facilities must contain, as part of their permanent equipment, ANSI/ASHRAE 110-1995 testing hardware as specified in that standard. In addition, all data readings shall be computer-recorded and the raw data submitted in disc format.

C. The manufacturer shall provide certification that fume hoods shall meet the performance requirements described under Appendix A "Fume Hood Performance Testing Requirements".

D. The manufacturer shall warrant the sash counterweight system, excluding glass, against defects in materials and workmanship for the life of the fume hood. Any material or manufacturing defect in these components will be repaired without charge by the manufacturer.

E. The manufacturer shall, for a period of one (1) year from date of shipment, warrant that furnished products shall be free from defects in material and workmanship. The manufacturer shall also warrant the products to be as represented and will repair or replace any part, under normal use, if examination discloses it to have been defective within the warranty period.

F. UL 1805 Specification: Fume hoods must be UL 1805 approved. This standard covers electrical and mechanical hazards, investigates the flammability of materials and measures the effectiveness of airflow characteristics. Proper labeling must be affixed to the face of each fume hood indicating classification to UL 1805. UL listings covering electrical components only or other listings that do not encompass all elements of UL 1805 are insufficient.

APPENDIX A – FUME HOOD PERFORMANCE TESTING REQUIREMENTS

A. General:
   1. One (1) hood of the same design as specified herein will be successfully tested as detailed below. Production of the hoods specified herein will not commence until the "Performance Test" has been successfully performed by the manufacturer. In general, the below detailed "Performance Test" will consist of the ANSI/ASHRAE 110-1995 test procedure using a five-minute tracer gas challenge at a rate of four (4) liters per minute. The PPM concentration outside the hood of a tracer gas released inside the hood will be measured utilizing a MIRAN 203 Gas Analyzer, or equivalent.

B. Test Procedure:
   1. Tracer gas orifice and ejector as specified in ANSI/ASHRAE 110-1995.
   2. Tracer gas is sulfur hexafluoride supplied from a cylinder capable of maintaining 30 PSI pressure at the test flow rate for at least five minutes. The test flow rate is four (4) liters per minute.
   3. Detector is a MIRAN 203 Infrared Spectrophotometer capable of indicating or recording concentrations of tracer gas in the range of 0.001 PPM, with an accuracy of $\pm$ 10% and a response time not to exceed ten (10) seconds to 90% indication of actual concentration.
   4. "Dummy" will be a manikin such as used in clothing display. The height of the manikin will be 67 inches with a shoulder height of 55" to 57", and otherwise represent normal proportions of the human body. Hairless dummies or torsos are unacceptable.
   5. The detector is calibrated with a known concentration of tracer gas within 24 hours preceding a test, using the methods furnished or specified by the detector manufacturer.

C. Test conditions:
1. Hood is tested with ceiling-supplied make-up air in a test area where face velocity, temperature, and room air flow can be monitored and documented.

D. Hood Condition:
1. The sash or sashes shall be located in the design position or positions.
2. If the hood has an auxiliary air supply, the supply shall be in operation.

E. Quantitative Test Procedure:
1. Turn on detector, allow time to reach equilibrium.
2. Insert orifice in test diffuser to give (4) liter per minute release rate.
3. Install diffuser to a central test position. This position is equidistant from the inside side walls, six inches behind the sash plane.
4. Install manikin standing 3" from the plane of the sash.
5. Turn on tracer gas block valve. Position the detector probe between the nose and lip of the manikin.
6. Observe and record the detector readings automatically. Background readings are to be taken before each test and subtracted from the actual test readings. The tests are run for five (5) minutes. An average reading above 0.07 PPM constitutes unsatisfactory performance under the conditions that exist for that test.
7. During the sixth and seventh minute of testing, the sash is closed completely. Then, at 420 seconds elapsed time, the sash is re-opened.
8. Between 450 and 510 seconds elapsed time, the hood perimeter is tested at a distance of 1" outside the plane of the sash.
9. During all these procedures, breathing zone gas concentration shall not exceed 0.05 PPM.

F. Qualitative Test Procedure:
1. Excerpt from SEFA 1.1 2002 (formerly SAMA Standard LF10-1981)

It is recommended that the user make provisions to have the following tests performed on all laboratory fume hoods. These tests should be performed by qualified personnel to verify proper operation of the fume hoods before they are put to use. The tests of the fume hoods should be performed after the installation is complete, the building ventilation system has been balanced and all connections made. Any unsafe conditions disclosed by these tests should be corrected before using the hood.

7.1 Test Conditions

Verify that building make-up air system is in operation, the doors and windows are in normal operating position, and that all other hoods and exhaust devices are operating at design conditions.

7.2 Test Procedure

7.2.1 Equipment List

a. A properly calibrated hot-wire thermal anemometer.
b. A supply of 2 -minute smoke candles.
c. A bottle of titanium tetrachloride and supply of cotton swabs or other recognized device for producing smoke.

7.2.2 Room Conditions

Check room conditions in front of the fume hood using a thermal anemometer and a smoke source to verify that the velocity of cross drafts does not exceed 20 percent of the specified average fume hood face velocity. Any cross drafts that exceed these values shall be eliminated before proceeding with fume hood test.

Caution: Titanium Tetrachloride fumes are toxic and corrosive. Use sparingly; avoid inhalation and exposure to body, clothing and equipment that might be affected by corrosive fumes.

Note: It must be recognized that no fume hood can operate properly if excessive cross drafts are present.

7.2.3 Face Velocity

Determine specified average face velocity for fume hood being tested. Perform the following test to determine if fume hood velocities conform to specifications or to the designated fume hood class. With the sash(es) positioned, turn on the exhaust blower. The face velocity shall be determined by averaging the velocity readings taken at the open fume hood face. Note: If not in accordance with specified face velocity, refer to Appendix A (Troubleshooting Guide) of the complete SEFA document for aid in determining the cause of variation in air flow. If face velocity cannot be corrected to that specified, reclassify fume hood to conform to actual face velocity.

7.2.4 Sash Operation

Check operation by moving sash(es) through its (their) full travel. Sash operation shall be smooth and easy. Vertical rising sashes shall hold at any height without creeping up or down, unless designed otherwise.

7.2.5 Verification of Proper Air Flow and Patterns

7.2.5.1 Fume Hoods without Auxiliary Air

a. Turn fume hood exhaust blower on.
b. With sash(es) in full open position, check air flow into the fume hood using a cotton swab dipped in titanium tetrachloride or other smoke source. Note: On fume hoods with horizontal sliding sash(es), check air flow with sash(es) at various full open positions. A complete traverse of the fume hood face should verify that air flow is into the fume hood over the entire face area. A reverse flow of smoke indicates unsafe fume hood operation.
c. Move a lighted smoke candle throughout the fume hood work area, directing smoke across the work surface and against the side walls and baffle. Smoke should be contained within the fume hood and be rapidly exhausted. (Fume hoods with horizontal sliding sash(es) will show reverse flow and turbulence behind sash panel, but no outflow of smoke shall be evident.)

7.2.5.2 Fume Hoods with Auxiliary Air

a. Turn exhaust blower on and determine face velocity in accordance with 7.2.3. Note: Face velocity and exhaust volumes shall be determined with the auxiliary air blower off.
b. Calculate exhaust volume from face velocity data.
c. Turn on auxiliary air, verify that auxiliary air volume is as specified. Locate a straight section of the supply air duct and drill two holes of a size appropriate for the pitot tubes to be used, 90 degrees apart, on a plane through the duct,

at the downstream end of the straight section. Measure the air velocity and calculate the air volume. Compare volumes determined with the specified volume of auxiliary air and with exhaust volume, to determine if proper ratio exists. Deviations of plus or minus five percent are acceptable. If deviations of more than five percent are noted, corrective measures should be taken. Seal holes in duct with duct tape or suitable sealant.

d. With sash(es) in the open position, check air flow into the fume hood using a cotton swab dipped in titanium tetrachloride or other smoke source. A complete traverse of the fume hood face should verify that air flow is into the fume hood over the entire face area. A reverse flow of air indicates unsafe fume hood operation.

e. Move a lighted smoke candle throughout the fume hood work area, directing smoke across the work surface and against the side walls and baffle. Smoke should be contained within the fume hood and be rapidly exhausted. Fume hoods with horizontal sliding sash(es) will show reverse flow and turbulence behind sash panel, but no outflow of smoke shall be evident.

7.2.6 Evaluation of Low Air Flow Monitor

On fume hoods with low flow warning devices, verify that monitor functions properly and indicates unsafe conditions.

APPENDIX B **– LINER PERFORMANCE REQUIREMENTS**

	POLYGLASS	PVC	POLYPROPYLENE	EPOXY RESIN	304 SS	316 SS
HYDROCHLORIC ACID 35%	0	0	0	0	4	4
HYDROFLUORIC ACID	1	0	0	3	4	4
PHOSPHORIC ACID 80%	0	0	0	0	1	1
NITRIC ACID 35%	0	0	0	0	0	0
SULFURIC 70%	0	0	0	0	2	3
ACETIC ACID	1	0	0	0	1	1
SODIUM HYDROXIDE 20%	0	0	0	2	0	0
ACETONE	0	1	1	0	0	0
ETHANOL	0	0	0	0	0	0
METHANOL	0	0	0	0	0	0
MEK	0	1	1	0	0	0
GASOLINE	0	0	0	0	0	0
CARBON TETRACHLORIDE	0	0	1	0	0	0
FORMALIN 35%	0	1	0	0	0	0
XYLENE	1	1	1	0	0	0

0= NO EFFECT 1= EXCELLENT 2=GOOD 3=FAIR 4= FAILURE

No effect: No detectable change in working surface material.

Excellent: Slight detectable change in color or gloss, but no change to the function or life of the working surface material.

Good: A clearly discernable change in color or gloss, but no significant impairment of working surface function or life.

Fair: Objectionable change in appearance due to surface discoloration or etch, possibly resulting in deterioration of function over a period of time.

Failure: Pitting, cratering or erosion of working surface material. Obvious and significant deterioration.

APPENDIX C – WORK SURFACE PERFORMANCE REQUIREMENTS

A. TEST RESULTS OF CHEMICAL RESISTANCE OF EPOXY RESIN WORKTOP (BLACK):

Reagent	**Results**
Acetate, Ethyl	Excellent
Acetic Acid, 5%	No Effect
Acetic Acid, Glacial	No Effect
Acetone	Excellent
Alcohol, Ethyl, 95%	No Effect
Alcohol, Methyl	No Effect
Ammonium Hydroxide, 10%	No Effect
Aniline	No Effect
Benzene	Excellent
Carbon Tetrachloride	No Effect
Chromic Acid, 40%	Good
Citric Acid, 1%	No Effect
Diethyl Ether	Excellent
Dimethylformanide	No Effect
Ethylene Dichloride	Excellent
Heptane	No Effect
Hydrochloric Acid, 10%	No Effect
Hydrochloric Acid, 37%	No Effect
Isooctane	No Effect
Kerosene	No Effect
Mineral Oil	No Effect
Nitric Acid, 40%	No Effect
Nitric Acid, 70%	No Effect
Oleic Acid	No Effect
Olive Oil	No Effect
Phenol Solution, 5%	Excellent
Soap Solution, 1%	No Effect
Sodium Carbonate Solution, 20%	No Effect
Sodium Hydroxide Solution, 60%	No Effect
Sodium Hypochlorite Solution, 4%	No Effect
Sulfuric Acid, 60%	Excellent
Sulfuric Acid, 96%	Failure
Toluene	No Effect
Transformer Oil	No Effect
Turpentine	No Effect

Test results duplicated above were conducted on black material. Other colors of epoxy resin may have slightly different results.

PART 3 EXECUTION

3.00 INSTALLATION - REFER TO INSTRUCTION AND INSTALLATION MANUAL

A. Install fume hoods and equipment in accordance with manufacturer's instructions.
B. Install equipment plumb, square, and straight with no distortion and securely anchored as required.
C. Secure work surfaces to casework and equipment components with material and procedures recommended by the manufacturer.
D. Accessory installation: Install accessories and fittings in accordance with manufacturer's recommendations.

3.01 OPTIONAL FIELD QUALITY CONTROL TESTING OF FUME HOODS

A. Have [all] [a representative number of one of each width of the] fume hoods static tested for three (3) minutes using ANSI/ASHRAE 110-1995. All hoods shall pass with an average rating of AI 0.05 or less.
B. Have [all] [a representative number of one of each width of the] fume hoods tested using SEFA 1.1 - 2002. All units tested shall pass using the specified criteria.

3.02 ADJUSTING

A. Repair (or remove and replace) defective work, as directed by Owner's Representative upon completion of installation.

B. Adjust sash and other moving or operating parts to ensure smooth, near-silent and accurate sash operation with one hand and with uniform contact of rubber bumpers. Ensure counterweights operate without interference.

C. Adjust fixtures and accessories to function smoothly.

3.03 CLEANING

A. Clean equipment, touch up as required.

3.04 PROTECTION OF FINISHED WORK

A. Provide all reasonable protective measures to prevent exposure of 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.

END OF SECTION