

SECTION 11610.1

LABORATORY FUME HOODS UNIFLOW LE SERIES

PART 1 GENERAL

1.00 SUMMARY

- A. Section Includes:
 - 1. Laboratory Fume Hoods
- B. Related Sections:
 - 1. Section 12345 – Laboratory Casework: Base units/work surfaces for fume hood and base unit construction.
- C. Reference Standards:
 - 1. UL 1805 – Standard for Laboratory Fume Hoods and Cabinets
 - 2. UL 3101 – Electrical Equipment for Laboratory use
 - 3. ASHRAE 110-1995 – Method of Testing the Performance of Laboratory Fume Hoods
 - 4. SEFA 1-2003 – Recommended Practices for Laboratory Fume Hoods
 - 5. NFPA-45 – Standard on Fire Protection for Laboratories
 - 6. ANSI/AIHA Z9.5-2012 – Standard on Ventilation for Laboratories
 - 7. OSHA 29-CFR-1910 – Occupational Safety and Health Standards
 - 8. CAL/OSHA 5154.1 – Ventilation Requirements for Laboratory-Type Hood Operations
 - 9. ASTM E-84 – Method of testing Surface Burning Characteristics of Building Materials
 - 10. CSA-22.2 – Canadian Standard for Wire/Cable Requirements and use
 - 11. ISO 9001-2008 – Certified Company
- D. “Made in USA” – Laboratory Fume Hoods manufactured and assembled entirely in the USA, ISO 9001-2008 Certified Company.

1.01 GENERAL FUME HOOD DESIGN REQUIREMENTS

- A. All fume hoods covered in this section are of the UniFlow LE Series with unitized dual wall composite construction. Molded aerodynamic face opening with upper and lower airfoils to minimize air flow turbulence and provide a constant volume of air flow thru the VaraFlow Baffle System to the integral bell shaped exhaust collar of the fume hood. The white component fume chamber is one piece molded with all coved corners and a glass smooth finish for ease of cleaning.
 - 1. **Constant Air Volume (CAV) Model:** This design has an automatic air bypass that provides a constant air volume thru the fume chamber to the bell shaped molded composite vent outlet. With the sash in the closed position the upper bypass and lower bypass is drawing 100% of the supply air. As the sash is raised, the upper bypass begins to close and is completely closed when the sash reaches the full open position.
 - 2. **Variable Air Volume (VAV) Model:** This design has a restricted bypass. With a design face velocity set, the air volume changes as the sash is raised or lowered. A minimum flow of 25 CFM per Ft² of surface is recommended by the NFPA when the sash is closed

- B. Superstructure and Mold Liner Material:** The UniFlow Laboratory Fume Hood Superstructure is unitized composite construction for total chemical resistance, strength, durability and reduced weight. Construction material are white thermosetting HiPel[®] composite resin surface layers with HiPel[®] fiberglass reinforced composite core. Construction materials are tested and classified by U.L. for Class A fire resistant, non-metallic materials used in laboratories. (ref. NFPA45)
- C. VaraFlow Baffle System:** Fume hood shall effectively maintain safe, constant exhaust volume at any baffle position. VaraFlow baffles will be constructed of upper, middle, and lower sections. Panels will be positioned such that horizontal and vertical edge slots effectively create near laminar air flow through the fume chamber. Baffles are factory set such that the fume hood is at its optimum performance level. Panels are constructed of HiPel[®] resin.
- D. Air Foil:** Molded of HiPel[®] composite resin (no sharp edge or pinch joints). Color finish shall be glass smooth (no paint on finish). Air foil across lower sash to provide clean sweep of air over work surface. One inch air bypass inlet under air foil to insure uniform air flow at face and to sweep heavier than air vapors off work surface.
- E. Removable Front Panel:** Located above the sash allows access to electrical connections, light bulb change out, sash weights and duct connections.
- F. Sash:** Picture frame sash is constructed of clear tempered safety glass. Frame, track and pull fabricated of chemical resistant PVC. Counterbalance system constructed of continuous coated, stainless steel aircraft cable with attached single sash counter weight for ease of movement. (Also available is laminated safety glass or polycarbonate sash option).
- G. Illumination of work area:** Minimum average of illumination in the fume hood chamber should be at least 80 foot candles. Work space 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 35 inches to the ceiling of the fume chamber.
- H. Passive Auto Sash (optional):** Automatic, non-motorized system. When raised to full open position, the passive sash mechanism returns the sash to half open.

1.02 SUBMITTAL INFORMATION

- A.** Submit manufacturer's test data and installation instructions for each type of fume hood. Provide data indicating compliance with UL 1805, ASHRAE 110-95 Standards and ISO 9001-2008.
- B.** Provide samples of the following:
 - 1. Interior fume hood liner material, 6" x 6" section
 - 2. Countertops with dished formation, 6" x 6" section
 - 3. Color samples of manufacturer's finish.
 - 4. Hardware and accessories including sample sash handle and/or pulls, cables, and pulleys.
- C.** Submittal drawings for proposed fume hoods shall include plans, elevations, sections and service run spaces. Detailed specifications must include notation of all specified items.
 - 1. Service fittings, as related to the fume hood, shall illustrate location and type when required.
 - 2. Mechanical and electrical services, as related to the fume hood, shall be illustrated where required.
 - 3. Face opening, air volume and static pressure data of each fume hood shall be clearly noted in drawings or separate documentation.

PART 2 PRODUCTS

2.00 MANUFACTURER

- A. "Made in USA" – Fume hoods and associated equipment entirely manufactured and assembled in the USA by: HEMCO Corporation, 711 South Powell Road, Independence, Missouri, 64054. ISO 9001-2008 and UL 1805 Certified and CSA Listed.

2.01 MATERIALS

A. **HiPel® composite construction of fume hoods :**

1. Molded: reinforced HiPel® (Two (2) white surfaces chemically bonded to a fiberglass reinforced core layer of Hipel® thermosetting resin. No exposed fiberglass. Nominal thickness of 4.5mm). Hipel® meets or exceeds the NFPA 45 Fire Protection for Laboratories using Chemicals. (UL 1805 Classified)

B. **Typical thickness:**

1. 3/16"-1/4" thick HiPel® composite resin. Double wall shall provide base for remote service fixture outlets, electrical boxes and other service that may be required.

C. **Sash glass:**

1. 3/16" Clear Tempered Safety Glass per ASTM C 1048 (standard)
2. 1/4" Laminated Safety Glass per ASTM C 1172 (optional)
3. 3/16" or 1/4" Polycarbonate Safety Glass (optional)

- D. **Sash:** Frame, track and lift constructed of chemical resistant polyvinyl chloride (PVC).

E. **Fastening devices:**

1. Interior surfaces: PVC-capped #8 pan stainless screws, nylon bolts
2. Exterior structural members: #8 pan stainless steel screws, nylon bolts

- F. **Fume Chamber:** One piece liner consists of all interior surfaces, sides, top, and back. See **APPENDIX B** for liner performance requirements.

1. Standard: Molded non-conducting HiPel® resin, nominal thickness of 3/16", white
2. Optional liner materials:
 - a. 304 Stainless steel, 16 GA, #4 finish
 - b. 316 Stainless steel, 16 GA, #4 finish
 - c. PVC plastic sheet, 1/4" nominal thickness
 - d. Polypropylene, white, 1/4" nominal thickness

2.02 CONSTRUCTION

- A. **Unitized Superstructure:** Consists of 3/16" thick, non-conducting, dual wall HiPel® composite resin side walls, 5" side wall width exterior. Side walls are chemically bonded to a molded liner so that the complete structure is composite unitized construction. Any framing not consisting of a complete fiberglass structure is unacceptable. Front and both sides of the superstructure are aligned for precision fit.

B. **Airfoils:**

1. Lower airfoil: Molded of non-conducting HiPel® composite resin. Airfoil across lower sash to provide clean sweep of air over work surface. One inch air bypass inlet under air foil to

ensure uniform air flow at the face of the fume hood. Sweeps heavier than air vapors off work surface.

2. Upper Airfoil: Molded of non-conducting HiPel[®] composite resin, that provides clean flow of air in upper area of the fume chamber to minimize turbulent air flow through the fume chamber.

C. Sash Assembly (choose one):

1. Full view vertical raising clear tempered safety glass framed in solid white PVC framing. The sash shall have full width finger sash pull; to have "trailing edge" to prevent back flow of fumes to escape fume chamber. The sash shall be counter balanced at a single point to eliminate racking of the sash. Sash shall require no more than a 5 pound force to lift. 1/8" diameter stainless steel aircraft cable connects the sash to the epoxy coated counterweight. Cable to have PVC coating to prevent corrosion. The cable rides on a 2" diameter nylon ball bearing pulley system. Sash cable to run through the bottom of the sash to prevent sash from dropping. Equipped with an adjustable counterweight for tilting adjustment. Pulley bearings stainless steel. Painted steel parts in the sash are not acceptable.
2. Combination sash has vertical viewing with horizontal sliding doors. Sliding panels constructed of clear tempered safety glass set into a stainless steel frame. Tracking is positioned within a 304 stainless steel sash frame. Combination sash allows for both horizontal and vertical movement options to the end user. The sash shall be counter balanced at a single point to eliminate racking of sash. Sash shall require no more than a 5 pound force to lift. Two 1/8" diameter stainless steel aircraft cables connect the sash to the epoxy coated counterweight. Cable to have PVC coating to prevent corrosion. The cable rides on a 2" diameter nylon ball bearing pulley system. Sash cable to run through the bottom of the sash to prevent sash from dropping. Equipped with an adjustable counterweight for tilting adjustment. Pulley bearings are stainless steel. Painted steel parts in the sash are not acceptable.
3. Horizontal sliding sash constructed of an anodized aluminum top rail and bottom track. Horizontal sliding sash shall be bottom supported. Sliding panels shall be framed with anodized aluminum frame on top and a bottom supported aluminum rolling frame. Standard clear tempered safety glass panels set into an aluminum track. Housed within the stainless steel rail. Painted steel parts in the sash are not acceptable.

D. VaraFlow Baffles: The fume hood superstructure shall have an internal baffle system of the same HiPel[®] composite material as the hood structure. Lower baffle shall consist of a staggered slotted array for near laminar air flow through fume chamber. The baffle system shall provide for safe efficient removal of fumes through the fume chamber. Baffles to have rounded entry edges to draw fumes smooth through baffle system. Baffles are removable for cleaning. Constructed of non-conducting, HiPel[®] composite resin.

E. Extended View Panel: Sash is extended taller to a system consisting of a 3/16" thick clear tempered safety glass panel allowing full visual display of fume hood interior.

F. Duct collars: Standard round exhaust outlet collar(s), bell entry from fume chamber to efficiently draw fumes into exhaust duct. The outlet to be constructed of the same material as the hood structure (HiPel[®] composite resin) and chemically bonded integral to the fume chamber ceiling. Metal screws, bolts or welds are not acceptable for attaching. 36" hood (1-8" dia); 48" hood (1-10" dia); 60" hood (1-10" dia); 72" hood (1-12" dia); 96" hood (2-10" dia).

G. Fascia posts: Aerodynamically angled to provide uniform air flow into the fume chamber. Shall be a continuation of the one piece homogeneous liner. Molded of non-conducting HiPel[®] composite resin.

- H. **Exterior Side Panels:** Molded of non-conducting HiPel® composite resin. Unitized and chemically bonded to form homogeneous one piece superstructure. Painted steel end panels not acceptable.
- I. **Clearance (interior):** All LE Series of hoods are designed to have a nominal interior vertical clearance of 44" in the front twelve inches of the hood depth. Dimensions of the interior may be affected by additional services or options.
- J. **Lighting:** Fluorescent light fixtures consist of 2 tube T-5's in the following standard configurations: 36" hood (1-24" fixture); 48" hood (1-24" fixture); 60" hood (1-36" fixture); 72" hood (1-48" fixture); 96" hood (2-36" fixtures).

(Options – choose one):

- 1. Hinged light fixture configured for (2) 3000K linear T-5 fluorescent lamps installed on the exterior of the fume hood roof. Light brackets constructed of stainless steel with a mirrored interior finish for maximum reflectivity. Painted steel brackets are not acceptable. A clear tempered safety glass panel is provided as a vapor-tight lens and seal to separate the fluorescent fixture from the hood interior. Fluorescent fixtures are UL listed and CSA listed. Fluorescent T-5 tubes provided with fixture. (115V/60Hz or 220V/50 Hz available) (UL 1805 Classified)
- 2. Explosion-proof fixture (with screw in sockets). (UL/CSA listed) installed but not wired.

K. Service Fittings and Fixtures:

- 1. Service fittings and fixtures shall be manufactured by the Water Saver Fixture Company or equal equivalent. Fixtures and handles shall indicate the proper service using color coding. The color codes are as follows:

<u>Service</u>	<u>Color</u>
Carbon Dioxide (CO ₂)	Pink
Gas (GAS)	Blue
Distilled Water (DW)	White
Air (AIR)	Orange
Hydrogen (HYD)	Pink
Vacuum (VAC)	Yellow
Nitrogen (NIT)	Brown
Steam (STM)	Black
Oxygen (OXY)	Lt. Green
Cold Water (CW)	Green
Hot Water (HW)	Red
Deionized Water (DI)	White
Other Services	Available upon request

2. Finish of Service Fixtures:

- a. Laboratory service fixtures (with the exception of fittings inside the fume hood) shall have **(Option – choose one):**
 - 1. A colored polished nylon handle with a full-view screw-on colored index button. (standard)
 - 2. A forged brass polished handle with a full-view screw-on colored index button. (optional)
- b. Service fittings inside the hood shall have an epoxy finish color that is coded to match the fixture service index color.

L. Electrical services:

1. All electrical receptacles, duplexes, and switches are prewired to a single junction box for electrical connection (with the exception of explosion proof models). All electrical receptacles are 3-wire, 15 or 20 amp duplex, 115 or 230 VAC, or as specified. Light switch shall be 3-wire polarized grounded, 15 amp, 125VAC or as specified. Electrical components are UL/CSA listed.

M. Work surfaces (Option – choose one):

1. Epoxy resin, 1-1/4" thick, molded to contain chemical spillage, dished section not less than 1/4" thick. Black
2. Phenolic resin, 1-1/4" thick, 1/4" dished section to contain chemical spillage. Charcoal
3. 316 stainless steel, 6 gauge, #4 finish, dished construction with marine edged, dished section not less than 1/4" thick. Constructed to contain chemical spillage.
4. 304 stainless steel, 16 gauge, #4 finish, dished construction with marine edge, dished section not less than 1/4" thick. Constructed to contain chemical spillage.

- N. Instruction Plate:** Corrosion resistant 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 ISO Quality Control Standards

- A.** Laboratory fume hoods provided will be the product of a single manufacturer. Each fume hood will be based on the specifications of the Uniflow LE series as described in section 2.02. Any manufacturer other than those specified shall provide proof of capability in the manufacturing of fume hoods and be prepared to have their manufacturing facility examined per customer request.
- B.** Any manufacturer desiring authorization for this project must maintain a fume hood examination test lab at their plant location. The test lab must provide make-up air and variable exhaust control. Floor-to-ceiling wall diffusers are unacceptable. All eligible test labs must have the ability to conduct ANSI/ASHRAE 110-1995 testing per customer request. All data readings shall be submitted in disc format.
1. "Made in USA" – Laboratory Fume Hoods manufactured and assembled entirely in the USA and is an ISO 9001-2008 Certified Company.
- C.** The manufacturer shall, for a period of five (5) years from date of shipment, Warrants that the fume hood shall be free from defects in material and workmanship. The manufacturer shall repair or replace any portion of the fume hood, under normal use, if examination discloses it to have been defective within the warranty period. Warranty to be submitted at time of submittal.
- D.** UL 1805 Classified: Fume hoods must be UL 1805 classified. This standard covers mechanical risks, examines the flammability of materials and measures the efficiency of airflow characteristics, electrical tested to UL 3101 with consistent operation. All fume hoods must bear the proper UL labeling and must be attached to the face of each fume hood indicating its classification to UL 1805. Must be green product certified and manufactured by an ISO 9001: 2008 Certified Company.

PART 3 EXECUTION

3.00 INSTALLATION - REFER TO OPERATION AND MAINTENANCE MANUAL

- A. Fume hoods and equipment shall be installed in accordance with manufacturer's instructions.
- B. Work surfaces shall be properly secured to casework using proper instructions recommended by the manufacturer.
- C. Accessory installation: All accessories and fittings shall be properly installed in accordance with manufacturer's recommendations.

3.04 PROTECTION OF FINISHED WORK

- A. Take protective action to prevent exposure of casework and equipment from exposure to other construction activity.
- B. Recommend contractor of proper procedures and precautions for protection of material, installed laboratory casework and fixtures from damage by work of other trades.

3.05 DELIVERY, STORAGE AND HANDLING

- A. Protect all finished surfaces from damage during handling and installation.
- B. Protect all work surfaces throughout construction period whenever possible.
- C. Upon receiving, inspect for crate damage and possible concealed damage that may have occurred in transit. Save all delivery receipts and crating materials. If damaged call the adjuster for the delivering carrier promptly and notify manufacturer.

APPENDIX A – FUME HOOD EXAMINATION REQUIREMENTS

A. General:

- 1. Manufacturer is responsible for submitting all performance data on proposed fume hoods. Production of the fume hoods shall not commence until manufacturer submits data. Data will consist of the ANSI/ASHRAE 110-1995 testing of one (1) hood of the same design as specified. ANSI/ASHRAE 110-1995 testing to be performed by manufacturer or third party.

B. Test Area:

- 1. Hood shall be tested in area with ceiling-supplied make-up air. Test area must be capable of climate and air flow control such that it can be monitored and documented.

C. Hood Condition:

- 1. The sash shall be located in the design position. Standard design position for operation set at the half open position.

D. Qualitative Examination Procedure:

- 1. Excerpt from ANSI/ASHRAE 110-1995: This test is a visualization of a hood's ability to contain vapors. The test consists of both a small local challenge and a gross challenge to the hood. The intent of this test is to render observation of the hood performance as it is typically used. Visible smoke is provided by means of a plastic bottle that contains an ampule of liquid titanium tetrachloride. Once the ampule is broken and the bottle squeezed, the plastic bottle will release a visible, persistent plume of titanium dioxide can be used to visualize airflow. Other sources of persistent, neutral buoyancy aerosols could provide the same visualization of the airflow.

6.1.1 Local Visualization Challenge

6.1.1.1 The operation of the bottom air bypass air foil shall be tested by running the smoke bottle under the air foil. Smoke shall be exhausted smoothly and not be entrained in the vortex at the top of the hood.

6.1.1.2 A stream of smoke shall be discharged from the bottle along both walls and the floor of the hood in a line parallel to the hood face and 6 in. (150mm) behind the face of the hood and along the top of the face opening.

6.1.1.3 A stream of smoke shall be discharged from the bottle in an 8 in. (220mm) diameter circle on the back of the hood. Air movement toward the face of the hood shall be defined as reverse airflow, and lack of air movement shall be defined as dead air space. Smoke shall be generated at the work top of the hood and along all equipment in the hood. All the smoke shall be carried to the back of the hood and exhausted. Airflow patterns and time for hood clearance shall be observed and noted.

6.1.1.4 If there is visible smoke flow out of the front of the hood, the hood fails the test and will receive no rating.

6.1.2 Large-Volume Visualization Challenge

A suitable source of smoke or other visual challenge shall be used to release a large volume in the center of the sash opening on the work surface 6 in. (150 mm) inside the rear edge of the sash. Some smoke sources generate a jet of smoke that produces an unacceptably high directional component to the challenge to the hood. Care is required to ensure that the generator does not disrupt the hood performance, leading to erroneous conclusions. It must be noted that containment is best observed from the side of the hood face. A release of smoke from the hood that is steady and visible is an indication of failure. Equipment in the hood, such as heating devices and agitators, shall operate during a test to determine if it contributes to leakage. Airflow patterns and time for hood clearance shall be observed and noted.

6.2 Face Velocity Measurements

A 1.0 ft² (300 mm x 300 mm) imaginary grid pattern shall be formed by equally dividing the hood opening into vertical and horizontal dimensions. Velocity readings shall be taken with a calibrated anemometer fixed at the center of the grid spaces. The anemometer shall be held in the plane of the hood sash and perpendicular to the opening.

6.2.1 Face velocities shall be integrated over a period of at least five seconds. If an anemometer is used that measures instantaneous point velocities a minimum of four readings shall be taken at each point.

6.2.2 Care shall be taken to stand to the side during measurement so as to affect the airflow as little as possible.

6.2.3 The average of the velocity measurements shall be calculated, and the highest and lowest readings shall be noted.

6.3 Test Method for Variable-Air-Volume (VAV) Fume Hoods

6.3.1 Verification shall be made that the VAV controls have been calibrated as defined by their manufacturer. This shall include calibration and adjustment of controllers, sensors, and VAV supply and exhaust boxes that are part of the system.

6.3.2 The sash shall be adjusted to 25% of the design hood opening, and the face velocity allowed to stabilize. Face velocity measurements shall be conducted as defined in 6.2 and results recorded.

6.3.3 The sash shall be adjusted to 50% of the design hood opening, and the face velocity allowed to stabilize. Face velocity measurements shall be conducted as defined in 6.2 and results recorded.

6.3.4 The sash shall be opened to the full design hood opening, and the face velocity allowed to stabilize. Face velocity measurements shall be conducted as defined in 6.2 and results recorded. All measurements shall be recorded.

6.3.5 Average face velocities for all sash positions shall be compared with design specifications.