**SECTION 11 53 13**

**HIGH PERFORMANCE LABORATORY FUME HOODS**

**DFD Master Specification dated 2/20/2020**

This section has been written to cover most (but not all) situations that you will encounter. Depending on the requirements of your specific project, you may have to add material, delete items, or modify what is currently written. The Division of Facilities Development expects changes and comments from you.

**PART 1 – GENERAL**

**SCOPE**

This section includes specifications for high performance laboratory fume hoods. Included are the following topics:

PART 1 – GENERAL

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**RELATED WORK**

Applicable provisions of Division 1 shall govern all work under this section.

Related Sections and Divisions:

Section 01 91 01 or 01 91 02, Commissioning Process

Section 11 08 00, Commissioning of Equipment

Section [ ]: Laboratory Casework and Fixtures

***A/E shall enter specification section for Laboratory Casework and Fixtures***

Division 22 - Plumbing utilities and final connections to fume hoods.

Division 23 - HVAC utilities and final connection to fume hoods.

Division 26 - Electrical utilities and final connections to fume hoods.

**REFERENCE STANDARDS**

ANSI/AIHA Z9.5 - 2003 Laboratory Ventilation Standard

ASHRAE 110-1995 Method of Testing Performance of Laboratory Fume Hoods

ASTM A336 Steel, Sheet, Carbon, Cold Rolled, Commercial Quality

ASTM E84 Surface Burning Characteristics of Building Materials

FS DD-GI403 Glass. Plate (Float), Sheet, Figured, and Spandrel (Heat Strengthened and

Fully tempered).

NFPA 45 Fire Protection for Laboratories Using Chemicals.

NFPA 56F Non-Flammable Medical Gas Systems.

NFPA 70 National Electric Code.

OSHA 29CFR Part 1910 Occupational Exposures to Hazardous Chemicals in Laboratories

UL 1805 Laboratory Fume Hoods and Cabinets

**DESIGN REQUIREMENTS**

Fume hoods shall function as ventilated, enclosed work spaces, designed to capture, confine and exhaust fumes and vapors produced or generated within the enclosure in accordance with the performance requirements specified in Part 2 of this section.

Constant volume, bench-type fume hood shall maintain essentially constant exhaust volume at any sash position. Maximum variation in exhaust CFM, static pressure and average face velocity as a result of sash adjustment shall not exceed 5% for any sash position at the specified exhaust volume.

Design face velocity with sash in full open position is 50 feet per minute. The vertical sash opening height used to measure the face velocity shall be 27-1/2 inches.

Fume hood shall be designed to minimize static pressure drop through hood. Maximum average static pressure loss readings taken three diameters above the hood outlet from four points, 90 degrees apart, shall not exceed 0.15 inches water column with sash in full open position at design face velocity.

Fume hoods shall be available in standard widths of 4, 5, 6, 7, & 8 feet.

The fume hood manufacturer shall provide a pre-piped, pre-wired junction box at the top of the fume hood for a single point connection of 120v AC power to supply receptacles, light switch and fixture, along with any other control or accessory requiring an electrical supply. Transformers required to step voltage down for fume hood controls or accessories shall be pre-installed and pre-wired in the factory by the fume hood manufacturer. Division 16 contractor will provide 120v AC power connection at junction box.

***Comment to A/E: Power requirements will need to be reviewed with users, agency and DFD. If receptacles other than 120v AC are required on the fume hood, the above paragraph will need to be revised accordingly.***

All work must conform to all State of Wisconsin Codes.

**QUALITY ASSURANCE**

Fume Hood must be Underwriters Laboratories subject 1805 classified. The 1805 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 the UL 1805 standard for Laboratory Fume Hoods. UL listing covering electrical components only or other listings that do not encompass all issues covered in UL 1805 is insufficient. All factory testing shall be performed in a U.L. certified test facility.

Installer’s Qualifications: Factory trained and certified by the manufacturer, and have five years or more experience in installation of laboratory fume hoods, casework and equipment of type specified. Installer shall be knowledgeable with calibration procedures for the fume hood alarm and monitor specified in Part 2 – Products.

**DELIVERY, STORAGE, AND HANDLING**

Handling: Protect finished surfaces from soiling or damage during handling and installation. Keep covered with polyethylene film or other protective coating. Protect all work surfaces throughout construction period with 1/4 inch corrugated cardboard completely covering the top and securely taped to edges. Any tape used on fume hood surfaces shall be non-delaminating. Manufacturer shall be responsible for removal of taping adhesive. Sash and counterbalance mechanism shall be secured for shipping .

**PROJECT CONDITIONS**

The fume hood manufacturer and installer shall review all project conditions and building limitations such as doorway sizes, corridor widths, ceiling heights, obstructions, etc. prior to bidding the project. The fume hood manufacturer and installer shall determine any disassembly and re-assembly methods necessary for access of each fume hood into its final location. Costs associated with disassembly, re-assembly and access to the fume hood final locations shall be included in the bid.

**SEQUENCING AND SCHEDULING**

Do not deliver or install fume hoods until the following conditions have been met:

* Building areas requiring the installation of fume hoods shall be dry and not exposed to construction activities or adverse weather conditions which may damage finished materials.
* Interior building temperatures shall not register below 65 degrees F. in areas of fume hood installation to permit the proper curing of epoxy sealants and adhesives.
* Walls and partitions must be in place and finished with at least the primer coat of paint. If finish painting is to take place after fume hood installation, protect fume hoods by covering and masking prior to commencement.
* Overhead soffits and ceiling grid must be in place and overhead lighting must be installed and connected prior to fume hood installation.
* All flooring required to be placed under fume hoods and base cabinets must be installed prior to material delivery.

**TRAINING**

Fume hood manufacturer’s representative shall provide a minimum of 1 hour of training for owner’s designated personnel in the operation and maintenance of the fume hoods. Training shall include demonstration on procedures for testing and calibration of fume hood monitors and alarms and all control devices.

Provide the users with a professional quality CD (minimum 15 minutes in length) on proper hood usage. The CD shall convey:

* The basic concept of a fume hood and how it serves to protect users.
* The function of the sash and its proper use.
* Safety rules for proper movement in the work zone.
* Safety rules for fume hood loading.
* A high volume smoke demonstration on the hood’s containment potential and how improper use can compromise containment.
* Fume hood alarm features and how the user should respond to these.

**SUBMITTALS**

Submit sufficient quantities of shop drawing review copies to allow the following distribution:

Project Operating and Maintenance Manuals 2 copies

Division of Facilities Development 1 copy

A/E 1 copy

Each fume hood shop drawing review copy shall include the following information:

Manufacturer’s product data for each type of hood specified. Include component dimensions, configurations, construction details, joint details, and attachments. Indicate location, size, and service requirements for each utility connection. Clearly identify all features on the submittals.

3/4 inch = 1 foot scale plans and elevations of individual and/or battery of hoods showing cross sections, rough-in and anchor placements, tolerances, and clearances. Indicate relation to other laboratory equipment, surrounding walls, windows, doors, and other building components.

Provide 1/4 inch = 1 foot rough-in plan drawings for coordination with trades.

3 inch by 5 inch finish samples of color of finish for fume hoods, work surfaces and for other prefinished equipment and accessories for selection by the Owner’s Representative.

Sound data for 63, 125, 250, 500, 1000, 2000, 4000 hertz octave bands.

Test Reports for each size hood verifying conformance to performance tests specified in Part 2 - Products. Reports may be submitted in electronic format, but written copy’s must also be submitted. Reports must be “third party” validated.

Fume hood instructional signage specified in Part 2 – Products.

Operation and maintenance manuals outlining proper operating and maintenance procedures for each different type of fume hood. O&M manuals shall include a complete parts list for the fume hood.

Operation and calibration manual for the fume hood monitors and alarms.

**WARRANTY**

Provide a 1-year warranty for parts and labor against defects in materials and workmanship.

**PART 2 - PRODUCTS**

**MANUFACTURERS**

Subject to compliance with specification requirements, provide one of the following products:

* Mott Manufacturing, Wisconsin Model
* Flow Safe, Vortex II
* Lab Crafters, Air Sentry
* Hamilton Laboratory Solutions, Pioneer
* Kewaunee Scientific, Wisconsin Supreme Air

Other manufacturers and/or products must undergo independent testing according to the performance requirements specified in this section. Independent testing shall be conducted by a firm designated by DFD. Results must be reviewed and approved by DFD prior to approval for bidding.

# FUME HOOD SERVICES, FIXTURES AND ACCESSORIES

Reference fume hood drawings, details and schedule for all service rough-in locations, fixture quantities and fixture mounting locations. The fume hood services and fixtures specified are common to both manufacturers listed above.

All service controls, switches and electrical receptacles shall be mounted at locations on the front of the fume hood post(s). Fume hoods specified or noted on the drawings to be ADA compliant shall have all fixture controls, switches and receptacles mounted at a maximum height of 54 inches off the floor.

PIPING SERVICES

Factory pre-piping shall extend 2 inches beyond top or bottom of the fume hood per rough-in locations on drawings. Pressure test all piping in factory. Pipe ends shall be capped until final connection is made by division 22 and division 23 contractors.

Water Service

3/8 inch, type L copper water tube, H (drawn temper, ASTM B88; wrought copper pressure fittings, ANSI B16.22 lead free (<.2%) solder, ASTM B32 flux, ASTM B813 copper phosphorous brazing alloy, AWS A5.8 Bcup.

Cold water piping, fittings and valve bodies shall be factory insulated with ½” thick closed cell elastomeric insulation. Slip insulation over piping where possible. Seal joints and seams with full bed of adhesive on both surfaces. Taped joints and seams are not acceptable.

Reagent Grade (R.O.) Water Service

Polypropylene pipe and fittings, copolymer ASTM D-4101, Schedule 80 or SDR 11, 150 psi rating at 68oF, maximum 200oF, heat fusion fittings.

Reagent grade water piping, fittings and valve bodies shall be factory insulated with ½” thick closed cell elastomeric insulation. Slip insulation over piping where possible. Seal joints and seams with full bed of adhesive on both surfaces. Taped joints and seams are not acceptable.

*Comment to A/E: Review the fume hood R.O. water service specification with the R.O. system design to ensure the materials and products in this specification meet the requirements for system purity established by the user agency or the project program.*

Vacuum and Nitrogen Service

3/8 inch, type L copper water tube, cleaned, washed and capped, H (drawn temper, ASTM B88; wrought copper pressure fittings, ANSI B16.22 lead free (<.2%) solder, ASTM B32 flux, ASTM B813 copper phosphorous brazing alloy, AWS A5.8 Bcup.

Natural Gas, Compressed Air, and Steam Service

ASTM A53, type E or S, standard weight (schedule 40) black steel pipe with ASTM A197/ANSI B16.3 class 150 black malleable iron threaded fittings using thread lubricant or teflon tape.

PLUMBING FIXURES

Cup Sinks

Modified epoxy resin, oval cup sinks, nominal 3 inch x 6 inch, 1-1/2 inch IPS outlet, color: black.

There shall be no raised lip around cup sinks in the fume hood work surface; drainage should be allowed to enter the cup sink.

Single service cold water fixtures

Forged brass valve bodies, 80 psi working pressure, renewable type neoprene valve disc and a replaceable stainless steel seat. Valve body shall be front loaded type mounted inside superstructure wall.

Fixture outlets shall be brass, stem type with 90 degree tip, panel mounted in side wall liner of fume hood above cup sink. Fixture outlet shall have removable serrated tips, acid and solvent resistant epoxy finish. . Fixture outlet shall have a color-coded mounting washer. Fixture control handle mounted in exterior superstructure post shall be chrome four arm handle with plastic color-coded center index button that matches color of serrated tip mounting washer.

Water fixtures shall be factory pre-piped with vacuum breakers in State of Wisconsin – Department of Commerce approved configuration.

Vacuum breaker equal to Watersaver Faucet Co. L100shall be mounted on exterior, top front corner of fume hood superstructure post. Vacuum breaker shall have polypropylene flow cup with air pocket for buoyancy and tight seal under low flow conditions.

Reagent Grade Water Fixtures

Forged brass valve bodies, 80 psi working pressure. All valve components in contact with pure water shall be polypropylene. Valve body shall be front loaded type mounted inside superstructure wall.

Fixture outlets shall be polypropylene, gooseneck type with panel mounted turret base in sidewall liner of fume hood above cup sink. Fixture outlet shall have removable serrated tip and color-coded mounting washer. Fixture control handle mounted in exterior superstructure post shall be black plastic bonnet type handle with plastic color-coded center index button that matches color of fixture mounting washer.

*Comment to A/E: Review the fume hood R.O. water service specification with the R.O. system design to ensure the materials and products in this specification meet the requirements for system purity established by the user agency or the project program.*

Vacuum, Natural Gas, Nitrogen, Compressed Air Fixtures

Forged brass valve bodies, 125 psi working pressure, needle valve construction with renewable type stainless steel floating cone and a replaceable stainless steel seat. Valve body shall be front loaded type mounted inside superstructure wall.

Fixture outlets shall be brass, stem type, panel mounted in sidewall liner of fume hood above cup sink. 30 degree angle removable serrated tips, acid and solvent resistant epoxy finish with color-coded mounting washer. Fixture control handle mounted in exterior superstructure post shall be chrome four arm handle with plastic color-coded center index button matching color of serrated tip mounting washer.

Steam Fixtures

Forged brass valve bodies, 20 psi working pressure, renewable type teflon valve disc and replaceable stainless steel seat. Valve body shall be front loaded type mounted inside superstructure wall.

Fixture outlets shall be brass, stem type, panel mounted in sidewall liner of fume hood above cup sink. 30 degree angle removable serrated tips, acid and solvent resistant epoxy finish with color-coded mounting washer. Fixture control handle mounted in exterior superstructure post shall be chrome four arm handle with plastic color-coded center index button matching color of serrated tip mounting washer.

ELECTRICAL SERVICES

The following specifications are for factory pre-wired electrical services within the laboratory fume hood. All materials and installation methods shall meet the requirements of the National Electric Code.

Wiring: minimum #12 copper, type THHN/THWN insulation. Wire color coding shall be black for current carrying conductors, white for neutral conductors and green for ground conductors.

Conduit: 1/2 inch, flexible metal conduit, galvanized spiral strip. Secure conduit to superstructure framework with conduit clamps.

Junction Boxes: 4 inch square by 2-1/8 inch deep, code gauge galvanized steel, screw covers.

Spring Wire Connectors: Solderless spring type pressure connector with insulating covers for splices and taps.

ELECTRICAL FIXTURES

All electrical devices shall be UL listed.

Fume hood light fixture shall have two lamps, rapid start, fluorescent type with sound rated electronic ballasts mounted on exterior of fume hood roof. Fixture shall be mounted in roof liner and sealed behind a laminated safety glass panel to isolate light fixture from fume hood interior. Interior of light fixture shall be white, high reflecting plastic enamel. Lamps shall be removable from the exterior of the fume hood.

Average illumination of work surface shall be at least 90 foot candles.

Lamps must be provided with fume hood light fixtures.

Light fixture switch shall be toggle type mounted in front post of superstructure. Switch cover plate shall be stainless steel with a brushed finish and labeled “LIGHT”.

Receptacles shall be duplex, GFCI, grounding type, hospital grade. Reference drawings for quantities, locations, amperage and voltage ratings of receptacles. Provide flush, stainless steel, brushed finish receptacle cover plates.

Unless noted otherwise, receptacles shall be 120v AC, 20A.

Comment to A/E: Review fume hood receptacle requirements with user group, agency and DFD. 208/220 VAC receptacles may be required for certain applications. The A/E must coordinate fume hood power requirements with the electrical drawings.

Fume light fixture, switch and receptacles shall be pre-wired by fume hood manufacturer to a junction box on the exterior roof of the fume hood for a single point power connection by the electrical contractor.

VENTILATION CONNECTIONS

Fume hood exhaust collar shall be rectangular or round with a parabolic, bell shaped, or tapered entry at the connection to fume hood to minimize static pressure drop. Collar shall be constructed of type 316L stainless steel or steel with a reagent resistant coating.

Coordinate with division 23 contractor for final exhaust duct connection to fume hood collar.

Provide 1-1/2” diameter polypropylene vent pipe connecting from the rear of the acid storage base cabinet to the inside hood chamber behind the rear baffle plate. Seal vent pipe penetration and extend minimum of 1” above fume hood work surface.

CEILING CLOSURE PANELS AND FILL PANELS

Do not utilize or provide ceiling enclosure panels.

INSTRUCTIONAL SIGNAGE

Provide instructional signage to explain the fume hood operational and safety instructions. Mount the signage on the front of each fume hood in plain view of user. Signage shall be plastic engraved laminate or directly applied silkscreen using chemical resistant epoxy ink. Signage shall have red background and white lettering (Font equal to Arial, 14 pt. or equal) to provide visual attraction.

See templates attached to the end of this specification for signage wording.

Sign shall also include manufacturer’s model number for the fume hood.

OPERATION and MAINTENANCE MANUALS AND TRAINING CD

The fume hood manufacturer shall provide a 8-1/2 x 11 sized, rigid plastic or stainless steel pocket permanently attached to the front of each fume hood for storage of operation and maintenance manuals.

Each fume hood shall be provided with its own copy of the fume hood operation and maintenance manual and the fume hood monitor/alarm operation and calibration manual that was approved during the shop drawing review. Note that these copies do not need to be the actual stamped and approved copies, but they must be duplicates of the shop drawing review copies that were stamped and approved. The manuals shall be provided in the pocket permanently attached to each fume hood.

A jacketed copy of the instructional training CD shall be provided for each fume hood in the permanently attached pocket on the fume hood.

SAFETY MONITOR AND ALARM SYSTEM

Acceptable safety monitors/alarms are:

TSI, Model FMH 10

Flow Safe, Model HAM-VFV

TEL, Model AFA 1000

Safety monitor and alarm shall continuously monitor face velocity and provide audible and visual alarm if face velocity falls below low alarm setpoint or rises above high alarm setpoint.

The monitor shall have one set of dry contacts for connecting alarm to either set back sequence or building management system.

Monitor and velocity sensor shall be factory installed and prewired on hood complete with low voltage transformer and transformer cable.

The calibration of the monitor shall be completed in the field by the fume hood installer. Reference Part 3 – Execution. Monitor shall be adjusted for an 40 FPM low alarm, 500 FPM high alarm.

*Comment to A/E: Include the paragraph below if there are any hoods with VAV fume hood controls. The fume hood monitors typically provided with the fume hood are not required on hoods with VAV fume hood controls because the VAV fume hood controls will include a monitor on the hood and the VAV fume hood controls are provided by others.*

[The following fume hoods will have VAV fume hood controls provided by division 23 with the fume hood monitor provided with the VAV fume hood controls. These fume hoods do not require fume hood monitors to be provided with the fume hoods. All other fume hoods on the project do require the factory installed monitors.

Fume hood \_\_\_\_

Fume hood \_\_\_\_

All fume hoods in room \_\_\_\_

All fume hoods in room \_\_\_\_]

**MOTT MANUFACTURING LIMITED REQUIREMENTS**

SUPERSTRUCTURE

Rigid, self-supporting assembly of double wall construction, maximum 4-7/8” thick. Wall consists of a sheet steel exterior shell and a corrosion resistant inner liner, and houses and conceals steel framing members, attaching brackets and remote operating service fixture mechanisms and services.

Exterior shell to be high quality, cold rolled, mild steel meeting requirements of ASTM A366; gauges U.S. Standard and galvanized. Finish with electrostatically applied reagent resistant polyester/urethane powder coat, minimum thickness 1.2 mils. Panels shall be fastened together using galvanized steel angles and channels, minimum 14 gauge. Panels and brackets attached with stainless steel screws with plastic caps on hood interior as needed for a secure superstructure.

Overall depth of fume hood superstructure, not including down-flow airflow chamber, shall be 38.625 inches.

Inner liner shall be fiberglass reinforced polyester panel; smooth finish and white color in final appearance. Flexural strength: 14,000 psi. Flame spread: 25 or less per U.L. 723 and ASTM E84-80. All interior seams to be sealed and caulked.

Access to fixture valves concealed in wall provided by exterior removable access panels and gasketed access panels on the inside liner walls. Gaskets: White 70 durometer PVC for interior access panels. Gasket interior access panels to eliminate air leakage and to retain liquids inside hood.

Baffle providing controlled air vectors into and through the fume hood shall be fabricated of the same material as the liner. Supports, and brackets to be non-metallic. High performance 1-piece baffle will be used. Baffle shall incorporate exhaust opening at work surface. Baffle to be non-adjustable, but removable for periodic cleaning and retrieval of debris.

Fume hood shall be equipped with a 2” high rectangular exhaust duct connection measuring 36” long x 3” wide.

Access opening perimeter shall have air foil or streamlined shape with all right angle corners radiused or angled.

Bottom horizontal air foil shall be angled design to minimize reverse flows and eddy currents at the work surface. Bottom air foil shall be stainless steel with polyester/urethane powder coating to increase acid and abrasion resistance. Air foil and sill to be no more than ½” above the height of the work surface.

Air foil shall not be removable without use of special tools.

Provide a steel safety bar with polyester/urethane powder coating across the full width of the bottom in front of the air foil positioned to prevent users from directly blocking the air foil with their body. The safety bar shall be located approximately 4 inches from the front edge of the bottom air foil and should not be removable without special tools.

FASTENINGS

Exterior structural members attachments: Sheet metal screws, zinc plated.

Interior fastening devices protected by plastic caps. Exposed screws not acceptable.

Exterior side access panel member fastening devices to be concealed spring steel clips.

WORK SURFACE

Modified epoxy resin 1-1/4” thick surface, dished at least 1/2” to contain spills, color: black.

Work surface cutout for cup sink shall have rabbet perimeter to allow flush mounting of cup sink rim with dished surface. Raised cup sink lips are prohibited.

Cup sinks shall be located in front half of work surface under water fixture. Coordinate installation with acid storage base cabinets beneath cup sink. Provide penetration through acid storage base cabinet for cup sink drain.

Reference drawings and details for right hand or left hand cup sink locations.

SASH

Combination vertical and horizontal sash shall have a 26 inch high access opening along with a fixed top viewing panel to provide a 35” high overall sight line. Sash frame on sides shall be no more than 1.5” wide, corrosion resistant steel with chemical resistant powder coating. Sash frame shall ride in extruded PVC sash guides. Bottom edge of sash frame shall be formed to minimize air flow turbulence into the hood. Horizontal sliding panels shall be 7/32” thick laminated safety glass, top hung on nylon tired stainless steel ball bearing wheels and provided with finger pulls. Horizontal sash panels shall be mounted to prevent easy removal. Fixed top viewing panel shall be minimum 7/32” thick laminated safety glass. Exposed glass edges of viewing panels and sash panes shall have stainless steel or plastic trim to protect operators from injury and prevent glass edges from chipping.

Sash counter balance system with sprocket and chain drive with single weight shall be self-leveling, prevent sash tilting, and permit ease of operation at any point along full width pull. Maximum 7 pounds pull required to raise or lower sash throughout its full length of opening. Life cycle test sash and weight. Open and close sash against rubber bumper stops.

Sash chain and pulley assembly: Chain to be ANSI #35 steel, single strand with an average tensile strength of 2,400 pounds, maximum working load of 480 pounds. Pulley assembly for sash chain shall be finished bored steel drive sprockets. Idler sprockets; double sealed ball bearings type, lubricated. All sprockets steel with zinc dichromate finish.

Auto-Sash mechanism shall be designed to promote usage of sash as an upper body and face shield. Sash operating position shall be based on the combination sash fully lowered with horizontal panels opened to the desired configuration of the user. Combination sash shall have the capability to be raised to full 26” vertical opening for loading, unloading and setup of large apparatus. A lock-open lever shall be provided. When lock-open is not engaged, the combination sash shall lower automatically to a nominal 18” position when released. Auto-sash function shall be life cycle tested and not incorporate the need for motor drives.

DOWN-FLOW AIRFLOW CHAMBER

Airflow chamber shall assist fume hood containment by directing room air between the operator and the hood from above sash opening. Chamber will be low resistance, 18 gauge steel with integral distribution media and polycarbonate honeycomb flow straightener at outlet. Multiple 24v DC Axial Fans shall be an integral part of the chamber. Housing to be powder-coat finished. The fans shall activate automatically when the combination sash is raised above the 18 inch open position. Fan speed is adjustable by a rheostat. The fans shall be controlled by a circuit board mounted on the top of the airflow chamber in a steel housing complete with rocker on/off switch to facilitate hood servicing. Vertical sash position shall be monitored by a string-pot type linear encoder. Upper and lower limits shall be re-programmable in the field if needed. Circuit board shall be equipped with an audible and visual alarm which will sound and illuminate if any one of the fans stops turning when needed. Down-flow fan control circuit board shall have integral monitoring with the following sequence of operation:

-When sash is raised above upper limit (18”) fans turn on, amber light turn on, intermittent alarm turns on.

-If tachometer sensor for any of the fans shows zero rotation, constant alarm turns on, RED indicator lamp turns on and fault output relay closes.

-continue monitoring fan rotation as long as sash is above upper limit - cancel alarm, red light and relay if all fans start spinning.

-When sash is below upper limit (18”) for more than 1 minute, turn off fans, stop monitoring fans.

-if sash is between lower limit (1”) and upper limit (18”), illuminate amber light

-if sash is below lower (1”) limit, illuminate green light

In addition to the above, the down-flow fan controller shall have the following features:

-RED, AMBER AND GREEN panel mount indicator lights on hood side post

-TTL level RS232 communications port for future use

-0 to 5v analog output proportional to sash position

-volt-free relay output for remote monitoring of fault condition

-Support for up to eight axial fan with tachometer monitoring for each

-Microcontroller shall be replaceable for future software updates

-Audible alarm shall be of the piezo type with a frequency of 4khz and a sound pressure level of 75 dbA measured 12” from the buzzer.

SAFETY MONITOR AND ALARM SYSTEM

Reference fume hood services, fixtures and accessories.

**FLOW SAFE REQUIREMENTS**

SUPERSTRUCTURE

Superstructure shall be double wall type.

Outer wall shall be 18 gauge cold rolled steel (ASTM A366M) finished per UL 1805. Powder coat finish to a minimum thickness 1.2 mil. Color selected from manufacturer’s standard color chart by architect/engineer.

Inner wall and baffles shall be galvanized steel covered with a minimum 3/16” thick chemically resistant white liner. The interior wall shall be securely held in place with stainless steel threaded fastenings with corrosion protection.

Flush mounted removable access panels shall be provided on inside walls of liner for maintenance of valves and remote control stem attachments. Inside panels shall be held in place using stainless steel threaded fasteners.

Electrical access shall be through the front of the hood.

Area surrounding sash opening shall be rounded to create an aerodynamic configuration with side posts maximum width 4.5 inches. Side posts shall incorporate an airfoil design. A multi-vector airfoil bypass and dynamic turning vane shall be mounted behind the sash.

Hood depth dimensions and vortex chamber shall be mathematically sized to support a Bi-Stable vortex.

A multi-vector airfoil bypass and dynamic turning vane shall be mounted behind the sash at the front edge of the work surface. Bypass airfoil and turning vane shall be coated steel with a chemical resistant finish. Airfoil shall be permanently attached via spring loaded pins to hood allowing airfoil to swing up for clearing of spill trough and for cord access. Fume hood shall incorporate a trough to collect spills underneath the multi-vector bypass airfoil.

Provide a steel safety bar with urethane powder coating across the full width of the bottom air flow positioned to prevent users from directly blocking the air foil with their body. The safety bar shall be located approximately 4 inches from the front edge of the bottom air foil and should not be removable without special tools.

SASH

Combination horizontal/vertical sash with1/4 inchlaminated safety glass.

Maximum sash opening shall be 27-1/2”. An additional 7” high, clear glass viewing panel integrated as part of the sash lintel shall maintain a clear vision height of 34” above countertop. Clear fixed viewing panel and horizontal sash panels shall have stainless steel or plastic trim on all exposed edges to protect operators from injury and prevent glass edges from chipping.

Sash frame shall be metal construction with chemical resistant finish.

Vertical sash movement shall allow hood loading and horizontal movement to provide a safety body shield when needed. No more than 1/8” air gap between sash and sash pocket. Horizontal sliding sashes shall be mounted on two tracks supported from top rail by rollers.

All glass panels shall have finger pulls on each horizontal panel and shall have plastic edge guard on all vertical edges of each horizontal panel. Bottom edge of vertical sash frame shall have full length finger pull with dynamic turning vane airfoil design.

Single front counterweight system shall include weights stainless steel cables (with minimum safety factor of 10, and not exposed to exhaust vapors) and sash guides, steel pulleys with cable retaining device. Counterweight system shall be balanced to provide smooth operation of the sash at any point along the full width of the bottom sash pull.

Sash height limiting hardware shall be provided, mounted on exterior of the hood, to prevent raising the vertical sash unintentionally above setpoint.

WORK SURFACE

Modified epoxy resin 1- thick surface, dished at least 1/4” to contain spills, color: black.

Work surface cutout for cup sink shall have rabbet perimeter to allow flush mounting of cup sink rim with dished surface. Raised cup sink lips are prohibited.

Cup sinks shall be located in front half of work surface under water fixture. Coordinate installation with acid storage base cabinets beneath cup sink. Provide a penetration through chemical storage base cabinet for the tailpiece of the cup sink drain.

Reference drawings and details for right hand or left hand cup sink locations.

BI-STABLE VORTEX BAFFLE CONTROL

The bi-stable vortex control system shall be factory installed and wired on the Vortex II fume hood.

The vortex control system shall include:

Dedicated VFV vortex pressure transducer controller

VFV electronic actuator

The baffle control system shall correct for fume hood loading, downdrafts, sash movements and activity in front of the hood to maximize fume hood containment.

Fume hood manufacturer’s representative shall setup and calibrate baffle control system upon completion of installation.

SAFETY MONITOR AND ALARM SYSTEM

Reference fume hood services, fixtures and accessories.

**LAB CRAFTERS REQUIREMENTS**

SUPERSTRUCTURE

Superstructure shall be double wall construction cold rolled steel that will house and conceal structural interior steel walls and service mechanisms. Inner steel wall, outer steel shell and inner liner shall be factory assembled as a rigid, self-supporting component. Fume hood front section shall be removable to facilitate the hood’s access into its final location.

Overall depth of fume hood superstructure shall be 39 inches.

Exterior shell to be 18 gauge reagent resistant polyurethane coated steel, color: selected from manufacturer's standard color chart by Architect/Engineer.

Inner liner and baffles shall be galvanized steel wall covered with 1/4" thick chemically resistantfiberglass reinforced polyester with smooth finish, color: white. Liner shall be held in place with concealed fasteners.

Flush mounted removable access panels shall be provided on inside walls of liner and on outside side panels to allow ease of maintenance on valves and baffle actuator.

Hood front to include posts, tracks, sash with weight, pulleys, cable, foil, pre-piped plumbing fixtures and pre-wired electrical fixtures. Hood front with sash and pre-wired electrical components, , are to be removable from hood body as a complete assembled one piece unit without disconnecting electrical components.

The superstructure perimeter surrounding the sash opening shall have an airfoil design for optimal airflow entry and containment at hood face. Hood post shall have airfoil design and not exceed 4-1/2 inches in width.

A multi-vector bottom airfoil mounted behind the sash and above the work surface shall be steel with a chemically resistant coating and shall have multi-channel slots. For ADA compliant fume hoods, a 2 inch deep trough below the airfoil is included to collect spills. The slotted airfoil shall be capable of swinging up to pass line cords underneath and to clear spillage from trough.

Provide a 316 stainless steel safety bar across the full width of the bottom air flow that is positioned to prevent users from directly blocking the air foil with their body. The safety bar shall be located approximately 4 inches from the front edge of the bottom air foil and be attached with tamper proof fasteners.

SASH

Combination horizontal/vertical sash withlaminated safety glass.

Overall vertical sash viewing height shall be 34 inches with a 7 inch high clear fixed panel along the top of the opening. Overall vertical sash opening height shall be 27 1/2".

Vertical sash shall be narrow 1-1/2” design and have built in horizontal sliding sashes that ride on rollers supported from the top rail in two tracks. Bottom edge of vertical sash shall have full length stainless steel pull with turning vane design. Clear fixed viewing panel and horizontal sash panels shall have stainless steel or plastic trim on all exposed edges to protect operators from injury and prevent glass edges from chipping.

Sash frame shall be aerodynamic radius design, , reinforced to support added weight and shall have a mechanism to allow it to move below the counter top. Sash frame shall be steel construction with chemically resistant coating.

Counterweight system shall include single weight, non-coated military spec 1/8-inch stainless steel cables and sash guides, ball bearing type nylon pulleys with cable retaining device. System shall be designed to prevent sash drop in the event of cable failure. Counterweight system shall be balanced to provide smooth operation of the sash at any point along the full width of the bottom pull and prevent sash creep at any position. Sash assembly shall be enclosed in the front 12 inches of the hood assembly and shall be easily removed with less than ten fasteners for service and transport into the lab.

WORK SURFACE

Modified epoxy resin 1- thick surface, dished at least 1/4” to contain spills, color: black.

Work surface cutout for cup sink shall have rabbet perimeter to allow flush mounting of cup sink rim with dished surface. Raised cup sink lips are prohibited.

Cup sinks shall be located in front half of work surface under water fixture. Coordinate installation with acid storage base cabinets beneath cup sink. Provide a penetration through chemical storage base cabinet for the tailpiece of the cup sink drain.

Reference drawings and details for right hand or left hand cup sink locations.

VORTEX CONTROL SYSTEM

The vortex control system shall be factory installed and wired on the Air Sentry™ fume hood.

The vortex control system shall include:

One (1) Controller/Monitor with Vortex Sensor

One (1) Baffle Actuator

The vortex sensor component shall be surface mounted in the fume hood sidewall and shall detect pressure difference between a stable and unstable vortex which is the direct indication of the fume hood performance.

The baffle controller shall be mounted on the fume hood post and shall control the electric servo motor that actuates automatic back wall baffles to maintain a stable vortex in the fume hood.

The electric servo actuator motor shall be 24VAC, 0-10 VDC input, 90 degree angle of rotation, current limited.

SAFETY MONITOR AND ALARM SYSTEM

Reference fume hood services, fixtures and accessories.

**HAMILTON REQUIREMENTS**

SUPERSTRUCTURE

Rigid, self supporting assembly of double wall construction, maximum 4-7/8” thick. Wall consists of a sheet steel exterior shell and a corrosion resistant inner liner, and houses and conceals steel framing members, attaching brackets and remote operating service fixture mechanisms and services.

Exterior shell to be high quality, cold rolled, mild steel meeting requirements of ASTM A366; gauges U.S. Standard and galvanized. Finish with electrostatically applied reagent resistant urethane powder coat, minimum thickness 1.2 mils. Panels must be attached to a full frame construction, minimum 14 gauge galvanized members. Panels and brackets attached to eliminate screw heads and metallic bracketry from hood interior.

Overall depth of fume hood superstructure, not including directed airflow chamber, shall be 37-1/4 inches.

Inner liner shall be poly-resin reinforced polyester panel; smooth finish and white color in final appearance. Flexural strength: 14,000 psi. Flame spread: 15 or less per U.L. 723 and ASTM E84-80. All interior seams to be sealed and caulked.

Access to fixture valves concealed in wall provided by exterior removable access panels, gasketed access panels on the inside liner walls, or through removable front posts. Gaskets: White 70 durometer PVC for interior access panels. Gasket interior access panels to eliminate air leakage and to retain liquids inside hood.

Baffles providing controlled air vectors into and through the fume hood shall be fabricated of the same material as the liner. Supports, and brackets to be non-metallic. Provide minimal exhaust slots full height on vertical sides of the baffle. High performance 2-piece baffle will be used. Baffle shall incorporate exhaust slots located to purge the upper and lower area of the hood. Baffle to be non-adjustable, but removable for periodic cleaning and retrieval of debris.

Access opening perimeter shall have air foil or streamlined shape with all right angle corners radiused or angled.

Bottom horizontal air foil shall be a triple vaned design to minimize reverse flows and eddy currents at the work surface. Bottom air foil shall be steel with urethane powder coating to increase acid and abrasion resistance. Air foil and sill to be no more than ½” above the height of the work surface. The air foil shall provide a nominal two inch bypass when sash is in the closed position with area between vanes sufficient in size to pass through electrical plugs. Air foil shall not be removable without use of special tools.

Provide a steel safety bar with urethane powder coating across the full width of the bottom air flow positioned to prevent users from directly blocking the air foil with their body. The safety bar shall be located approximately 4 inches from the front edge of the bottom air foil and should not be removable without special tools.

FASTENINGS

Exterior structural members attachments: Sheet metal screws, zinc plated, blunt nose. No sharp edges on the screw points.

Interior fastening devices concealed. Exposed screws not acceptable. (Screw head “caps” not acceptable).

Exterior side access panel member fastening devices to be exposed corrosion resistant, non-metallic material, creating a positive mechanical latch. Latch must be flush type. Exposed screws or velco type fasteners – not acceptable.

WORK SURFACE

Modified epoxy resin 1-1/4” thick surface, dished at least 1/2” to contain spills, color: black.

Work surface cutout for cup sink shall have rabbet perimeter to allow flush mounting of cup sink rim with dished surface. Raised cup sink lips are prohibited.

Cup sinks shall be located in front half of work surface under water fixture. Coordinate installation with acid storage base cabinets beneath cup sink. Provide penetration through acid storage base cabinet for cup sink drain.

Reference drawings and details for right hand or left hand cup sink locations.

SASH

Combination vertical and horizontal sash shall have a 27.5 inch high access opening along with a fixed top viewing panel to provide a 35” high overall sight line. Sash frame on bottom and sides shall be no more than 1.5” wide, corrosion resistant steel with chemical resistant powder coating. Sash frame shall ride in extruded PVC sash guides. Bottom edge of sash frame shall be formed to minimize air flow turbulence into the hood. Horizontal sliding panels shall be 7/32” thick laminated safety glass, top hung on nylon tired stainless steel ball bearing wheels and provided with finger pulls. Horizontal sash panels shall be mounted to prevent easy removal. Fixed top viewing panel shall be minimum 3/8” thick laminated safety glass. Exposed glass edges of viewing panels and sash panes shall have stainless steel or black plastic trim to protect operators from injury and prevent glass edges from chipping.

Sash counter balance system with sprocket and chain drive with single weight shall be self-leveling, prevent sash tilting, and permit ease of operation at any point along full width pull. Maximum 7 pounds pull required to raise or lower sash throughout its full length of opening. Life cycle test sash and weight. Open and close sash against rubber bumper stops.

Sash chain and pulley assembly: Chain to be ANSI #35 steel, single strand with an average tensile strength of 2,400 pounds, maximum working load of 480 pounds. Pully assembly for sash chain shall be finished bored steel drive sprockets and keyed drive, 1/2” dia. Front connector shaft. Rear idler sprockets; double sealed ball bearings type, lubricated. All sprockets steel with zinc dichromate finish.

Auto-Sash mechanism shall be designed to promote usage of sash as an upper body and face shield. Sash operating position shall be based on the combination sash fully lowered with horizontal panels opened to the desired configuration of the user. Combination sash shall have the capability to be raised to full 27.5” vertical opening for loading, unloading and setup of large apparatus. A lock-open lever shall be provided. When lock-open is not engaged, the combination sash shall lower automatically to a nominal 18” position when released. Auto-sash function shall be life cycle tested and not incorporate the need for motor drives.

A integrated visual sash alarm light, separate from the safety monitor and alarm specified below, shall annunciate when the sash is raised above 1 inch from the fully closed position.

An integrated audible sash alarm, separate from the safety monitor and alarm specified below, shall annunciate when the sash position is raised above the 18 inch open position.

DIRECTED AIRFLOW CHAMBER

Airflow chamber shall assist fume hood containment by directing room air between the operator and the hood from above sash opening. Chamber will be low resistance, 18 gauge steel with integral distribution media and polycarbonate honeycomb flow straightener at outlet. Blower shall be integral part of the chamber with dual forward curved wheels. Motor shall be shaded pole, low horsepower rated for a 30,000 hour duty cycle. Housing to be powder-coat finished and vibration isolated. The blower shall activate automatically when the combination sash is raised above the 18 inch open position.

SAFETY MONITOR AND ALARM SYSTEM

Reference fume hood services, fixtures and accessories.

**KEWAUNEE REQUIRMENTS**

Fume Hood Superstructure Frame:  
A structure of steel support members shall be provided to support exterior panels and interior liner and baffle panels. To allow for maintenance and replacements, the baffle panels shall be removable without disassembly of the frame structure and outer steel panels. Likewise, the exterior steel panels shall be removable without disassembly of the frame structure and inner liner panels.

Fume Hood Dimensions:  
Double wall end panel thickness shall not exceed 4.5". Interior clear working height shall be not less than 38” at any location in the interior of the hood on bench hoods. Interior depth from the back of the sash to the front of the rear baffle shall not be less than 24”. The sash opening shall be not less than 28" in height above the worksurface on bench hoods.

Fume Hood Interior Walls:  
Double wall ends, not more than 4.5" wide, with sash track flush with front vertical facia, 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 facia shall be in a plane 45° from the hood face and end walls. This facia shall contain space for the required service controls and electrical devices.

Fume Hood Airfoil:  
A 12 gauge painted steel, convergence z-cross section airfoil shall be mounted flush to the bottom of the hood opening. It shall provide no open space between it and the top front edge of the worksurface. The foil shall assure a flow of air rearward within 1/2” above the worksurface at all hood operating face velocities. A midriff safety bar shall be incorporated along the front of the airfoil extending the entire width of the fume hood opening.

Provide a powder coated steel safety bar across the full width of the bottom in front of the air foil positioned to prevent users from directly blocking the air foil with their body. The safety bar shall be located approximately 4 inches from the front edge of the bottom air foil and should not be removable without special tools.

Fume Hood Top Panel:  
Fume hood top panel shall incorporate an type dynamic barrier bypass providing a clean air stream behind the sash plane.

Fume Hood Baffles:  
The fume hood baffles shall be constructed of the same material as the hood lining. They shall consist of multiple sections with vertical slots and a continuous horizontal slot at the worksurface. Each baffle panel shall be easily removable from the interior, without requiring liner disassembly.

Fume Hood Duct Collar:  
Each fume hood up to six feet in length shall contain one (1) 12” polyethylene bell-mouthed duct collar in the hood roof for exhausting the hood. Fume hoods over six feet in length shall contain two (2).

Fume Hood Lighting:  
The light fixture shall be isolated from the hood interior by a 1/4" thick tempered glass panel sealed from the hood cavity. Fixture shall be UL listed.

Fume Hood Sash:  
A combination (type A) sash shall be provided. The sash shall have horizontal sliding panels in a vertical rising steel frame. The horizontal glass panels shall be top hung and made of ¼” laminated safety glass. The sash shall be counterbalanced with a single weight to prevent tilting and binding during operation. The sash shall be connected to the counterweight system with two, 1/2” wide steel-reinforced polyurethane notched belts that engage a sprocketed shaft drive and be so configured that when lifted higher than 18”, the sash will return to the 18” operating position automatically. The sash shall provide a minimum of a 35-1/2” viewing height, with a maximum opening of 27.5” and shall incorporate a mechanism for latching it in the full-open position for hood set-up.

Hood Worksurface   
Hood worksurface shall be 1-1/4" thick molded epoxy resin made in the form of a watertight pan, not less than 3/8" deep to contain spillage. A cup drain flush with the recessed worksurface shall be provided. The nominal 3” X 6” cupsink shall be of an anti-splash design with a horizontal rear outlet not extending more than 7” below the worksurface.

Access Opening:  
The interior end liner panels shall be furnished opening that provides access to the service piping and valves to facilitate installation and maintenance. The openings shall be filled with a removable gasketed panel made from fume hood liner material.

KEMGLASS Reinforced Polyester Lining:  
Interior liner panels shall be 1/4" thick fiberglass reinforced polyester sheet. Interior liner panels shall be fastened using stainless steel screws with plastic covered heads. The material shall have an ASTM E84 Class A flame spread rating (25 or less).  
  
SAFETY MONITOR AND ALARM SYSTEM

Reference fume hood services, fixtures and accessories.

**PERFORMANCE REQUIREMENTS**

The fume hoods specified must meet the following performance requirements which is an owner modified version of the ASHRAE 110-1995 standard, Method of Testing Performance of Laboratory Fume Hoods. This test has already been successfully completed by Mott, Hamilton, Flow Safe, Kewaunee and Labcrafters and so is not required for these three manufacturers unless there have been significant changes to the hood design since it was tested.

The manufacturers will furnish the specified fume hoods in sizes scheduled on the drawings, the test facility, and ventilation equipment necessary to perform the specified tests. An owner designated, independent, third party testing firm will perform the testing at the manufacturer’s site according to the following specifications. The test report will be prepared and submitted by the testing firm. All costs associated with the performance testing are to be included in the project bid.

TEST FACILITY:

The manufacturer’s test facility shall be sufficient size to provide similar conditions the fume hood will experience in normal as-used operating conditions. Provide make-up air and general exhaust system controls so that space pressure can be fluctuated between +0.015 inches w.c. to –0.015 inches w.c.

TESTING EQUIPMENT:

Hot wire thermal anemometer probe equal to TSI Velocicalc 8384 and recently calibrated (within one year) by a certified facility or by ISA Certified Level III Technologist.

* 30 second smoke bombs or titanium tetrachloride smoke sticks. Caution: Titanium tetrachloride is hazardous and skin contact or inhalation must be avoided.
* Smoke machine, Comet 4 Colt or equal theatrical smoke generator.
* Tracer gas: Industrial grade 3, sulfur hexa-flouride gas supplied from a cylinder.
* Ejector system: Tracer gas ejector will be the same as outlined in ANSI/ASHRAE 110-1995 standard.
* Critical orifice: Sized to provide tracer gas at eight liters per minute at an upstream pressure of 30 psig.
* Detection instruments: Foxboro Miran IA, Foxboro Miran Sapphire, or equal. Calibration of analyzer must be performed at time of testing. Analyzer will be calibrated to 0 to 0.15 PPM full-scale range versus analyzer output.
* Recorder with an accuracy better than plus or minus 0.05% of full scale, and be indicating recording at real time.
* Three dimensional mannequin, overall height 67 inches, clothed in smock.
* Cross flow fan consisting of a blower, plenum chamber and filters at outlet to produce steady flow. Blower speed shall be adjustable through a variac to produce variable flow rates from the cross flow fan.
* Ten cardboard boxes each measuring 12 inches high x 9 inches wide x 8 inches deep used for fume hood loading during tracer gas containment tests.

PRELIMINARY TEST AND DATA:

Provide a sketch of test room indicating room layout, hood and door locations, location of significant equipment including hood(s), test equipment and air supply system.

Face velocity measurements:

Face velocity shall be determined by averaging a minimum of 12 readings at the hood face. Take readings at center of grid made up of sections of equal area across the top, center and bottom of the full sash opening. Each reading is recorded after a minimum 10 second duration at each point.

Sash operation:

Check sash operation by moving sash through its full travel. Verify that sash operation is smooth and easy, and that vertical rising sash holds at any height without creeping up or down.

Exhaust airflow variations:

Monitor exhaust airflow with various vertical and horizontal sash positions from fully open to completely closed. Airflow must not vary more than 5 % between any positions.

Fume hood static pressure drop:

The fume hood static pressure will be measured per ANSI/ASHRAE 41.3-1989 standard of pressure measurement, in the center of the exit plane 6 inches above the top plane of the collar. Static pressure shall not exceed 0.15 inches w.c. at 50 FPM sash face velocity through the fully open sash.

Local Smoke Test:

Move smoke stick in a pattern smoke inside the fume hood along both inside walls and work surface in a line 6 inches behind and parallel to the hood face, and along the top of the face opening. Swab an 8 inch diameter circle on the back of the hood. All smoke should be carried to the back of the hood and exhausted.

Test the operation of the bottom air bypass airfoil by running smoke under the airfoil.

If visible smoke flows out of the front of the fume hood, the hood fails the test.

Large Volume Smoke Test:

Using the smoke machine, generate a pattern smoke inside the fume hood along both inside walls and work surface in a line 6 inches behind and parallel to the hood face, and along the top of the face opening. All smoke should be carried to the back of the hood and exhausted.

Test the operation of the bottom air bypass airfoil by running smoke under the airfoil.

If visible smoke flows out of the front of the fume hood, the hood fails the test.

TRACER GAS CONTAINMENT TESTING:

Containment tests shall be performed statically and dynamically using an owner modified ANSI/ASHRAE 110-1995 method of testing performance of laboratory fume hoods as specified below.

All containment testing shall be performed with the fume hood loaded with 12 inch long x 9 inch wide x 8 inch deep boxes. The boxes shall be arranged to sit on the 9x8 side. The configuration shall be five 9 inch wide boxes across and two rows high, centered in the fume hood. Spacing between the boxes will be approximately 2 inches. The back of the boxes shall be positioned approximately two inches in front of the fume hood baffles. Bottom boxes shall rest on the work surface and not be elevated above work surface.

All static containment testing shall be performed with an induced 75 FPM cross draft. The cross draft plenum fan shall be arranged so the outlet of the plenum is even with one side of the fume hood and positioned 15 inches from the front of the sash. The cross draft velocity shall be measured at a single point behind the head of the mannequin, 18 inches from the closed sash.

Containment testing shall be performed with the gas detector probe in the mannequin positioned at 26 inches above the work surface and also at 18 inches above the work surface.

Fume hood shall at no time exceed a maximum spill above 0.05 PPM at 8.0 liter/minute tracer gas release. Fume hoods exceeding this spillage rate during the test procedure fail the test.

Containment tests shall be conducted at full 27-1/2” vertically open sash at 50 FPM plus or minus 3 fpm average sash face velocity for the mannequin and ejector positions specified below.

The gas ejector shall be installed in test positions per ANSI/ASHRAE 110-1995 guideline. For a typical bench type hood, three positions are required: left, center and right as seen looking into the hood. In the left position the ejector centerline shall be 12 inches from the left inside wall of the hood. In the center position the ejector shall be equal distance from the inside sidewalls. In the right position the ejector centerline shall be 12 inches from the right inside sidewall of the hood. The ejector body shall be positioned 6 inches behind the hood face in all positions.

Position the mannequin facing the front of the hood, centered on the ejector. Fix detector probe in the region of the nose and mouth of the mannequin. Installation shall insure that method of attachment of the probe does not interfere with the flow patterns around the mannequin. Perform tests with the detector probe 9 inches in front of the ejector (3 inches in front of sash) and 26 inches above the work surface. Repeat the containment tests with the detector probe 9 inches in front of the ejector and 18 inches above the work surface.

Fume hoods shall pass the three position static tracer gas containment test in the manufacturer’s test facility for both detector probe elevations. At no time can a peak spill exceed 0.05 PPM. Fume hoods exceeding this level fail the test.

The mannequin shall be positioned in the center test position with the detector probe 9 inches in front of the ejector and 26 inches above the work surface. The dynamic (SME) and (SPE) containment tests specified below shall be conducted and the results recorded. The tests will be repeated with the mannequin lowered so the detector probe is 9 inches in front of the ejector and 18 inches above the work surface. Record these results. At no time can a peak spill exceed 0.05 PPM. Fume hoods exceeding this level fail the test.

Sash Movement Effect (SME) dynamic containment test:

The ejector shall be located in the center test position and mannequin shall be positioned as specified in the preceding paragraph with the sash fully closed. The block valve shall be opened releasing 8 liters per minute SF6 gas. At thirty seconds, the sash shall be fully opened vertically in a smooth motion at a velocity between 1.0 ft/s and 1.5 ft/s. At sixty seconds, the sash shall be fully lowered in a smooth motion at a velocity between 1.0 ft/s and 1.5 ft/s. The cycle shall be repeated at thirty second intervals for the duration of the five minute. The sash movement effect (SME) is the maximum peak tracer gas concentration determined in the test. The sash movement performance rating of the hood shall be recorded as SME-AM yyy, where yyy equals peak sash movement effect concentration in PPM. At no time can a peak spill exceed 0.05 PPM.

Space Pressure Effect (SPE) dynamic containment test:

The ejector shall be located in the center test position and mannequin shall be positioned as specified in the preceding paragraph with the sash at 27-1/2” full vertical opening. The block valve shall be opened releasing 8 liters per minute SF6 gas. The test chamber room shall be set for –0.05 inches w.c. pressure with the test room door closed. At thirty seconds, the test chamber door shall be abruptly opened in less than one second. At sixty seconds the test chamber door shall be abruptly shut in less than one second. The cycle shall be repeated at thirty second intervals for the duration of the five minute test. The space pressure effect (SPE) is the maximum peak tracer gas concentration determined in the test. The space effect rating of the hood shall be recorded as SPE-AM yyy, where yyy equals peak space effect concentration in PPM. At no time can a peak spill exceed 0.05 PPM.

**SUMMARY OF REQUIRED CONDITIONS FOR CONTAINMENT TESTING**

Note: 1) All tests shall be conducted with a 27.5 inch high fully open sash.

2) All conditions shall include loading fume hoods with boxes.

3) A 75 FPM cross draft shall be induced across the fume hood face for all static tests (conditions 1 through 6)

**Mannequin Sash Face**

**Condition Gas Sensor Height Ejector Test Type Velocity**

**No. Above Work Surface Position Static/Dynamic (FPM)**

**1 26 inches Center Static 50**

**2 26 inches Left Static 50**

**3 26 inches Right Static 50**

**4 18 inches Center Static 50**

**5 18 inches Left Static 50**

**6 18 inches Right Static 50**

**7 26 inches Center Dynamic (SME) 50**

**8 26 inches Center Dynamic (SPE) 50**

**9 18 inches Center Dynamic (SME) 50**

**10 18 inches Center Dynamic (SPE) 50**

TEST REPORT:

Provide three copies of final test report in a bound manual. Provide a cover page identifying the project title, location and DFD project number. Performance test technician and witnesses shall sign and date the report.

For each fume hood type tested, the test report shall include the following:

copy of the room layout sketch

preliminary test data information and observations of smoke testing results.

graphical results of concentrations for the duration of each test condition along with peak value of concentration for the duration of each test described in the summary above.

recorded data from the analyzer results for each test condition.

The summary of containment test conditions specified above identifies the different parameters for each test condition. The report format shall reference each test condition specified above.

The summary of test conditions shall be conducted for each type and size of hood scheduled on the drawings.

**PART 3 - EXECUTION**

**INSTALLATION**

Assemble hood components into complete installation. Components include: work surface, pre-piped and

pre-wired superstructure, cup sink.

Coordinate with base cabinet and casework installation. Coordinate fume hood installation with HVAC, plumbing and electrical services.

Install hoods plumb, level, rigid and securely anchored in accordance with manufacturer recommendations.

Secure work surfaces to casework and equipment components with material and procedures recommended by the manufacturer.

Set cup sinks in work surfaces with using manufacturer recommendedblack, chemical resistant caulk. Set base cabinet vents the connect to fume hood.

Accessory installation: Install accessories and fittings in accordance with manufacturer’s recommendations.

**ADJUSTMENTS AND CALIBRATION**

Repair or remove and replace defective work, as directed by the Owner’s Representative upon completion of installation.

Adjust sash fixtures, accessories and other moving or operating parts to function smoothly.

Calibration of the fume hood monitor and alarm system shall be by the fume hood installer knowledgeable in the operation of these components. Calibration shall take place either in conjunction with, or after the fume hood ventilation systems have been adjusted by the Division 23 testing and balancing firm. Alarm calibration shall include zeroing the monitor, calibration of reading through measurement, and setting high/low alarm set points.

Test each monitor and alarm to insure its proper operation.

Submit a calibration and test report at the completion of the work to document

**CLEANING**

Clean finished surfaces, touch up as required and remove or refinish damaged or soiled areas, as

acceptable to Architect/Engineer. Clean sashes and work surfaces free of smudges, dust and debris.

Vacuum clean the upper side of the fume hood to prevent debris from entering the work zone. This area shall be inspected and the manufacturer and installer required to provide clean up.

Protection: Advise Contractor of procedures and precautions for protection of materials and installed

fume hoods from damage by work of other trades.

**PROTECTION OF FINISHED WORK**

Provide all necessary protective measures to prevent damage to equipment from exposure to other construction activity.

Advise Contractor of procedures and precautions for protection of material and installed fume hoods from damage by work of other trades.

**CONSTRUCTION VERIFICATION**

Contractor is responsible for utilizing the construction verification checklists supplied under specification Section 11 08 00 in accordance with the procedures defined for construction verification in Section 01 91 01 or 01 91 02.

**FUNCTIONAL PERFORMANCE TESTING**

Contractor is responsible for utilizing the functional performance test forms supplied under specification Section 11 08 00 in accordance with the procedures defined for functional performance testing in Section 01 91 01 or 01 91 02.

**FIELD INSTALLED TESTING**

After the fume hoods are installed and balanced and the HVAC system is balanced, the manufacturer must provide standard ASHRAE 110 testing of every fume hood.

# AGENCY TRAINING

All training provided for agency shall comply with the format, general content requirements and submission guidelines specified under Section 01 91 01 or 01 91 02.

### INSTRUCTIONAL SIGNAGE

Instructional signage templates are provided on the following three pages of the specification. Each manufacturer shall provide their respective operating instruction sign on their fume hoods. Both manufacturers shall also provide the safety instruction signs on their fume hoods.

Signage shall have solid red background with white lettering.

**MOTT MANUFACTURING RFV3 Fume Hood Operating Instructions**

## Read before using this laboratory fume hood

**This laboratory fume hood is designed for operator protection and energy conservation. Your cooperation in observing fume hood rules is for your protection as well as the protection of your neighbors. Call safety/environmental health for training or further assistance.**

**This fume hood has been tested as manufactured for 50 FPM face velocity through a full open sash.**

Proper sash operation is very important for maintaining optimum containment with this fume hood

* **When using hazardous materials inside the fume hood, completely lower the vertical sash and work through the horizontal sash openings or with the vertical sash at 18 inches.**
* **If the vertical sash must be raised for setup purposes, first close the horizontal sash panels.**
* Raising the vertical sash above 18 inches will activate the supportive flow to enhanced containment. Contact your supervisor if the fan does not work or if an audible alarm activates when sash is above 18 inches.
* The fume hood monitor’s continuous audible and visual alarm will activate under a low air velocity condition when the sash is raised. Lowering the sash should automatically silence the fume hood monitor’s alarms.
* For extended setup procedures, the vertical sash can be locked in the full open position and the fume hood monitor’s “mute” can be pressed to silence the continuous audible alarm.
* Contact your supervisor if the audible alarms or sash position light are activated when the vertical sash is down.

**Fume Hood Product No.**

**Flow Safe Vortex II Fume Hood Operating Instructions**

## Read before using this laboratory fume hood

**This laboratory fume hood is designed for operator protection and energy conservation. Your cooperation in observing fume hood rules is for your protection as well as the protection of your neighbors. Call safety/environmental health for training or further assistance.**

Proper sash operation is very important for maintaining optimum containment with this fume hood

* **When using hazardous materials inside the fume hood, completely lower the vertical sash and work through the horizontal sash openings.**
* **If the vertical sash must be raised for setup purposes, first close the horizontal sash panels.**
* When the vertical sash is raised, an audible and visual alarm will activate. This is a reminder that the sash is above the operating position.
* **The audible warning may be silenced by pressing the “mute” button, or by lowering the vertical sash.**
* Contact your supervisor if the audible or visual warning stays in alarm when the vertical sash is down.
* **The rear baffle inside the fume hood at the back moves in response to changes in airflow patterns. This is normal operation and is designed to maintain stable containment. Make sure apparatus in the fume hood does not block or restrict the baffle movement.**

**Fume Hood Product No.**

Proper sash operation is very important for maintaining optimum containment with this fume hood

When using hazardous materials inside the fume hood, completely lower the vertical sash and work through the horizontal sash openings.

If the vertical sash must be raised for setup purposes, first close the horizontal sash panels.

* When the vertical sash is raised, an audible and visual alarm will activate. This is a reminder that the sash is above the operating position.

The audible warning may be silenced by pressing the “mute” button, or by lowering the vertical sash.

* Contact your supervisor if the audible or visual warning stays in alarm when the vertical sash is down.

The rear baffle inside the fume hood at the back moves in response to changes in airflow patterns. This is normal operation and is designed to maintain stable containment. Make sure apparatus in the fume hood does not block or restrict the baffle movement.

Fume Hood Product No.

Proper sash operation is very important for maintaining optimum containment with this fume hood

When using hazardous materials inside the fume hood, completely lower the vertical sash and work through the horizontal sash openings.

If the vertical sash must be raised for setup purposes, first close the horizontal sash panels.

* When the vertical sash is raised, an audible and visual alarm will activate. This is a reminder that the sash is above the operating position.

The audible warning may be silenced by pressing the “mute” button, or by lowering the vertical sash.

* Contact your supervisor if the audible or visual warning stays in alarm when the vertical sash is down.

The rear baffle inside the fume hood at the back moves in response to changes in airflow patterns. This is normal operation and is designed to maintain stable containment. Make sure apparatus in the fume hood does not block or restrict the baffle movement.

Fume Hood Product No.

Proper sash operation is very important for maintaining optimum containment with this fume hood

When using hazardous materials inside the fume hood, completely lower the vertical sash and work through the horizontal sash openings.

If the vertical sash must be raised for setup purposes, first close the horizontal sash panels.

* When the vertical sash is raised, an audible and visual alarm will activate. This is a reminder that the sash is above the operating position.

The audible warning may be silenced by pressing the “mute” button, or by lowering the vertical sash.

* Contact your supervisor if the audible or visual warning stays in alarm when the vertical sash is down.

The rear baffle inside the fume hood at the back moves in response to changes in airflow patterns. This is normal operation and is designed to maintain stable containment. Make sure apparatus in the fume hood does not block or restrict the baffle movement.

Fume Hood Product No.

**Lab Crafters Air Sentry Fume Hood Operating Instructions**

## Read before using this laboratory fume hood

**This laboratory fume hood is designed for operator protection and energy conservation. Your cooperation in observing fume hood rules is for your protection as well as the protection of your neighbors. Call safety/environmental health for training or further assistance.**

Proper sash operation is very important for maintaining optimum containment with this fume hood

* **When using hazardous materials inside the fume hood, completely lower the vertical sash and work through the horizontal sash openings.**
* **If the vertical sash must be raised for setup purposes, first close the horizontal sash panels.**
* When the vertical sash is raised, an audible and visual alarm will activate. This is a reminder that the sash is above the operating position.
* **The audible warning may be silenced by pressing the “mute” button, or by lowering the vertical sash.**
* Contact your supervisor if the audible or visual warning stays in alarm when the vertical sash is down.
* **The rear baffle inside the fume hood at the back moves in response to changes in airflow patterns. This is normal operation and is designed to maintain stable containment. Make sure apparatus in the fume hood does not block or restrict the baffle movement.**

**Fume Hood Product No.**

Proper sash operation is very important for maintaining optimum containment with this fume hood

When using hazardous materials inside the fume hood, completely lower the vertical sash and work through the horizontal sash openings.

If the vertical sash must be raised for setup purposes, first close the horizontal sash panels.

* When the vertical sash is raised, an audible and visual alarm will activate. This is a reminder that the sash is above the operating position.

The audible warning may be silenced by pressing the “mute” button, or by lowering the vertical sash.

* Contact your supervisor if the audible or visual warning stays in alarm when the vertical sash is down.

The rear baffle inside the fume hood at the back moves in response to changes in airflow patterns. This is normal operation and is designed to maintain stable containment. Make sure apparatus in the fume hood does not block or restrict the baffle movement.

Fume Hood Product No.

Proper sash operation is very important for maintaining optimum containment with this fume hood

When using hazardous materials inside the fume hood, completely lower the vertical sash and work through the horizontal sash openings.

If the vertical sash must be raised for setup purposes, first close the horizontal sash panels.

* When the vertical sash is raised, an audible and visual alarm will activate. This is a reminder that the sash is above the operating position.

The audible warning may be silenced by pressing the “mute” button, or by lowering the vertical sash.

* Contact your supervisor if the audible or visual warning stays in alarm when the vertical sash is down.

The rear baffle inside the fume hood at the back moves in response to changes in airflow patterns. This is normal operation and is designed to maintain stable containment. Make sure apparatus in the fume hood does not block or restrict the baffle movement.

Fume Hood Product No.

Proper sash operation is very important for maintaining optimum containment with this fume hood

When using hazardous materials inside the fume hood, completely lower the vertical sash and work through the horizontal sash openings.

If the vertical sash must be raised for setup purposes, first close the horizontal sash panels.

* When the vertical sash is raised, an audible and visual alarm will activate. This is a reminder that the sash is above the operating position.

The audible warning may be silenced by pressing the “mute” button, or by lowering the vertical sash.

* Contact your supervisor if the audible or visual warning stays in alarm when the vertical sash is down.

The rear baffle inside the fume hood at the back moves in response to changes in airflow patterns. This is normal operation and is designed to maintain stable containment. Make sure apparatus in the fume hood does not block or restrict the baffle movement.

Fume Hood Product No.

**Hamilton Pioneer Fume Hood Operating Instructions**

## Read before using this laboratory fume hood

**This laboratory fume hood is designed for operator protection and energy conservation. Your cooperation in observing fume hood rules is for your protection as well as the protection of your neighbors. Call safety/environmental health for training or further assistance.**

**This fume hood has been tested as manufactured for 50 FPM face velocity through a full open sash.**

Proper sash operation is very important for maintaining optimum containment with this fume hood

* **When using hazardous materials inside the fume hood, completely lower the vertical sash and work through the horizontal sash openings.**
* **If the vertical sash must be raised for setup purposes, first close the horizontal sash panels.**
* Raising the vertical sash above 18 inches will activate the laminar flow fan above the sash opening to provide enhanced containment. The fume hood’s sash position light and intermittent audible beep will also activate to indicate a setup sash position.
* The fume hood monitor’s continuous audible and visual alarm will activate under a low air velocity condition when the sash is raised. Lowering the sash should automatically silence the fume hood monitor’s alarms.
* For extended setup procedures, the vertical sash can be locked in the full open position and the fume hood monitor’s “mute” can be pressed to silence the continuous audible alarm. Releasing the manual lock will automatically lower the vertical sash to the 18 inch position.
* Contact your supervisor if the audible alarms or sash position light are activated when the vertical sash is down.

**Fume Hood Product No. **

Proper sash operation is very important for maintaining optimum containment with this fume hood

When using hazardous materials inside the fume hood, completely lower the vertical sash and work through the horizontal sash openings.

If the vertical sash must be raised for setup purposes, first close the horizontal sash panels.

* Raising the vertical sash above 18 inches will activate the laminar flow fan above the sash opening to provide enhanced containment. The fume hood’s sash position light and intermittent audible beep will also activate to indicate a setup sash position.
* The fume hood monitor’s continuous audible and visual alarm will activate under a low air velocity condition when the sash is raised. Lowering the sash should automatically silence the fume hood monitor’s alarms.

For extended setup procedures, the vertical sash can be locked in the full open position and the fume hood monitor’s “mute” can be pressed to silence the continuous audible alarm. Releasing the manual lock will automatically lower the vertical sash to the 18-inch position.

* Contact your supervisor if the audible alarms or sash position light are activated when the vertical sash is down.

Fume Hood Product No.

Proper sash operation is very important for maintaining optimum containment with this fume hood

When using hazardous materials inside the fume hood, completely lower the vertical sash and work through the horizontal sash openings.

If the vertical sash must be raised for setup purposes, first close the horizontal sash panels.

* Raising the vertical sash above 18 inches will activate the laminar flow fan above the sash opening to provide enhanced containment. The fume hood’s sash position light and intermittent audible beep will also activate to indicate a setup sash position.
* The fume hood monitor’s continuous audible and visual alarm will activate under a low air velocity condition when the sash is raised. Lowering the sash should automatically silence the fume hood monitor’s alarms.

For extended setup procedures, the vertical sash can be locked in the full open position and the fume hood monitor’s “mute” can be pressed to silence the continuous audible alarm. Releasing the manual lock will automatically lower the vertical sash to the 18-inch position.

* Contact your supervisor if the audible alarms or sash position light are activated when the vertical sash is down.

Fume Hood Product No.

Proper sash operation is very important for maintaining optimum containment with this fume hood

When using hazardous materials inside the fume hood, completely lower the vertical sash and work through the horizontal sash openings.

If the vertical sash must be raised for setup purposes, first close the horizontal sash panels.

* Raising the vertical sash above 18 inches will activate the laminar flow fan above the sash opening to provide enhanced containment. The fume hood’s sash position light and intermittent audible beep will also activate to indicate a setup sash position.
* The fume hood monitor’s continuous audible and visual alarm will activate under a low air velocity condition when the sash is raised. Lowering the sash should automatically silence the fume hood monitor’s alarms.

For extended setup procedures, the vertical sash can be locked in the full open position and the fume hood monitor’s “mute” can be pressed to silence the continuous audible alarm. Releasing the manual lock will automatically lower the vertical sash to the 18-inch position.

* Contact your supervisor if the audible alarms or sash position light are activated when the vertical sash is down.

Fume Hood Product No.

# Safety Instructions

Failure to follow these instructions could result in physical injury or illness.

CAUTION: Do not use this hood for Perchloric Acid Procedures.

* Do not use this fume hood unless you have received proper training. For more information, read the user manual or request training from the owner’s safety representative.
* This fume hood is not intended for use with all chemicals or all chemical processes. Consult the owner’s safety representative to determine appropriate chemicals and processes to be used.
* Place chemicals and other work materials at least six (6) inches inside the sash.
* Wear gloves and other protective clothing if contact with contaminants is a hazard. Avoid putting your head in the fume hood if contamination is present.
* Do not restrict airflow inside the hood or block the inside back wall of the fume hood with large items. Large apparatus should be elevated on blocks to allow free air circulation.
* Remove all materials not needed for the immediate work. The hood must not be used for storage purposes.
* External air movement can affect the fume hood’s containment capability. Avoid rapid movement inside and in front of the fume hood. Do not open the sash rapidly.
* Clean spills immediately.
* Follow good safety practice by careful attention to your behavior, proper use of sashes and reporting flow monitor alarms.

Work smart not fast !

Failure to follow these instructions could result in physical injury or illness.

CAUTION: Do not use this hood for Perchloric Acid Procedures.

* Do not use this fume hood unless you have received proper training. For more information, read the user manual or request training from the owner’s safety representative.
* This fume hood is not intended for use with all chemicals or all chemical processes. Consult the owner’s safety representative to determine appropriate chemicals and processes to be used.
* Place chemicals and other work materials at least six (6) inches inside the sash.
* Wear gloves and other protective clothing if contact with contaminants is a hazard. Avoid putting your head in the fume hood if contamination is present.
* Do not restrict airflow inside the hood or block the inside back wall of the fume hood with large items. Large apparatus should be elevated on blocks to allow free air circulation.
* Remove all materials not needed for the immediate work. The hood must not be used for storage purposes.
* External air movement can affect the fume hood’s containment capability. Avoid rapid movement inside and in front of the fume hood. Do not open the sash rapidly.
* Clean spills immediately.
* Follow good safety practice by careful att**For extended setup procedures, the vertical sash can be locked in the full open position and the fume hood monitor’s “mute” can be pressed to silence the continuous audible alarm. Releasing the manual lock will automatically lower the vertical sash to the 18-inch position.**
* ention to your behavior, proper use of sashes and reporting flow monitor alarms.

Work smart not fast !

Failure to follow these instructions could result in physical injury or illness.

CAUTION: Do not use this hood for Perchloric Acid Procedures.

* Do not use this fume hood unless you have received proper training. For more information, read the user manual or request training from the owner’s safety representative.
* This fume hood is not intended for use with all chemicals or all chemical processes. Consult the owner’s safety representative to determine appropriate chemicals and processes to be used.
* Place chemicals and other work materials at least six (6) inches inside the sash.
* Wear gloves and other protective clothing if contact with contaminants is a hazard. Avoid putting your head in the fume hood if contamination is present.
* Do not restrict airflow inside the hood or block the inside back wall of the fume hood with large items. Large apparatus should be elevated on blocks to allow free air circulation.
* Remove all materials not needed for the immediate work. The hood must not be used for storage purposes.
* External air movement can affect the fume hood’s containment capability. Avoid rapid movement inside and in front of the fume hood. Do not open the sash rapidly.
* Clean spills immediately.
* Follow good safety practice by careful attention to your behavior, proper use of sashes and reporting flow monitor alarms.

Work smart not fast !

Failure to follow these instructions could result in physical injury or illness.

CAUTION: Do not use this hood for Perchloric Acid Procedures.

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* This fume hood is not intended for use with all chemicals or all chemical processes. Consult the owner’s safety representative to determine appropriate chemicals and processes to be used.
* Place chemicals and other work materials at least six (6) inches inside the sash.
* Wear gloves and other protective clothing if contact with contaminants is a hazard. Avoid putting your head in the fume hood if contamination is present.
* Do not restrict airflow inside the hood or block the inside back wall of the fume hood with large items. Large apparatus should be elevated on blocks to allow free air circulation.
* Remove all materials not needed for the immediate work. The hood must not be used for storage purposes.
* External air movement can affect the fume hood’s containment capability. Avoid rapid movement inside and in front of the fume hood. Do not open the sash rapidly.
* Clean spills immediately.

Follow good safety practice by careful attFor extended setup procedures, the vertical sash can be locked in the full open position and the fume hood monitor’s “mute” can be pressed to silence the continuous audible alarm. Releasing the manual lock will automatically lower the vertical sash to the 18-inch position.

* ention to your behavior, proper use of sashes and reporting flow monitor alarms.

Work smart not fast !

**Kewaunee Scientific Supreme Air Fume Hood Operating Instructions**

## Read before using this laboratory fume hood

**This laboratory fume hood is designed for operator protection and energy conservation. Your cooperation in observing fume hood rules is for your protection as well as the protection of your neighbors. Call safety/environmental health for training or further assistance.**

**This fume hood has been tested as manufactured for 50 FPM face velocity through a full open sash.**

Proper sash operation is very important for maintaining optimum containment with this fume hood

* **When using hazardous materials inside the fume hood, completely lower the vertical sash and work through the horizontal sash openings or with the vertical sash at 18 inches.**
* **If the vertical sash must be raised for setup purposes, first close the horizontal sash panels.**
* Raising the vertical sash above 18 inches will activate the supportive flow to enhanced containment. Contact your supervisor if the fan does not work or if an audible alarm activates when sash is above 18 inches.
* The fume hood monitor’s continuous audible and visual alarm will activate under a low air velocity condition when the sash is raised. Lowering the sash should automatically silence the fume hood monitor’s alarms.
* For extended setup procedures, the vertical sash can be locked in the full open position and the fume hood monitor’s “mute” can be pressed to silence the continuous audible alarm.
* Contact your supervisor if the audible alarms or sash position light are activated when the vertical sash is down.

**Fume Hood Product No. **

**END OF SECTION**