Laboratory Fume hood

PRODUCTS

2.01 MANUFACTURER

A. Design, materials, construction and finish of fume hood specified is the minimum acceptable standard of quality for laboratory fume hood. The basis of this product specification is Invincible Furniture Solutions, 842 S 26th Street, Manitowoc, WI 54220.

2.02 FUME HOOD MATERIALS

A. Steel: High quality, cold-rolled mild steel, meeting requirements of ASTM A1008; gauges U.S. Standard and galvanized.

B. Stainless steel: Type 304; gauges U.S. Standard.

C. Ceiling closure panels: Minimum 18 gauge; finish to match hood exterior.

D. Downdraft bypass: Low resistant type, 18 gauge steel chamber, directional louvers—not acceptable. All bypass air shall enter top of bypass chamber and enter hood in a down flow direction. Chamber shall protect user from expelled particulate in the event of an adverse internal reaction.

E. Safety glass: 7/32" thick laminated safety glass or 3/8" thick laminated safety glass viewing panel.

F. Sash chain: ANSI #35 steel, single strand. Average tensile strength of 2,400 pounds; maximum working load of 480 pounds.

G. Sash guides: Extruded PVC.

H. Pulley assembly for sash chain: Finish bored steel drive sprockets and keyed drive, 1/2” diameter front connector shaft. Rear idler sprockets; double sealed ball bearings, lubricated. All sprockets steel with zinc dichromate finish.

I. Sash pull: Corrosion resistant steel with chemical resistant powder coating. Maximum 1.5" thick.

J. Gaskets: White 70 durometer PVC for interior access panels. Gasket interior access panels to eliminate air leakage and to retain liquids inside hood.

K. Fastenings:

1. Exterior structural members' attachments: Sheet metal screws, zinc plated.
2. Interior fastening devices concealed. Exposed screws not acceptable. (Screw head "caps" are acceptable.)
3. 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 Velcro fasteners—not acceptable.

L. Instruction plate: Corrosion resistant or plastic plate attached to the fume hood exterior with condensed information covering recommended locations for apparatus, accessories, baffle settings and use of sash.

2.03 FUME HOOD CONSTRUCTION

A. Superstructure: Rigid, self-supporting assembly of double wall construction, maximum 4-7/8" thick.
   1. Wall consists of a sheet steel outer shell with urethane powder finish and a corrosion resistant inner liner. This wall houses and conceals steel framing members, attaching brackets and remote operating service fixture mechanisms and services. Panels must be attached to a full frame construction, minimum 14 gauge galvanized members. Panels and brackets attached to eliminate screw heads and metallic bracket from hood interior.
      [Specified option] Exterior sidewalls and upper front panel to be plain-sliced Maple with either 304 stainless steel or powder coat steel front panels.
   2. Access to fixture valves concealed in wall provided by exterior removable access panels, gasket access panels on the inside liner walls, or through removable front posts.

B. Exhaust outlet: Rectangular with radiused ends, shaped and flanged, 18 gauge steel finished with urethane powder coating.

C. Access opening perimeter: Airfoil or streamlined shape with all right angle corners radiused or angled. Bottom horizontal foil shall provide nominal one-inch bypass when sash is in the closed position. Bottom foil shall be removable without use of special tools. Bottom foil shall provide access area sufficient in size to pass thru hospital grade electrical plugs. Bottom foil: Steel with urethane powder coating to increase acid and abrasion resistance. Airfoil and sill to be low profile design. A secondary containment trough shall be located in front of the work surface and extend below the airfoil sill.

Select one of the two sash options.

D1. Fume hood sash: (**Vertical**) Full view type with clear, unobstructed, side-to-side view of fume hood interior and service fixture connections. Sash to have a 35-inch sight line and a 28.5" vertical access height.
Bottom sash rail: 2" maximum, 18-gauge steel with powder coating finish. Provide integral formed, flush pull the full width of bottom rail. Full width extruded dual durometer bottom bumper and airflow control strip. Set safety glass into rails in deep form, extruded poly-vinyl chloride glazing channels available on constant volume and restricted bypass hoods

D2. Fume hood sash: (**Combination**) Vertical and horizontal sash access with a 35" high sight line. Sash shall be top hung on nylon tired stainless steel ball bearing wheels. Sash frame on bottom and sides must be no more than 1.5" thick and radiused to minimize turbulence. Area above the 28" vertical sash opening shall be glazed with a minimum of 3/8" thick laminated safety glass. All glass to have polished exposed edge treatment. Horizontal panels provided with finger pulls. Combination sash is available on restricted bypass hoods only.

Use combination sash and a maximum of two mechanical fixtures per side to meet ADA requirements.

E. Counter balance system: Single weight, sprocket and chain, counter balance system which prevents sash tilting and permits ease of operation at any point along full width pull. Maximum 7 pounds pull required to raise or lower sash throughout its full 18" height of operating sash opening. Life cycle test sash and weight. Provide independent test data. (See 2.02 F, G and H for material descriptions.) Open and close sash against rubber bumper stops.

F. Airfoil: The airfoil will be low profile, relatively flush to the work surface with ample room for hospital grade electrical cords to fit beneath the airfoil. This sill to be used on both sash types. Sill to be ergonomically radiused on front edge. Sill must pivot forward to provide cord and trough access. Airfoil sills that are not low profile are not acceptable.

G. Fume hood liner: Polyresin (product number denoted by the suffix "P"): Reinforced polyester panel; smooth finish and white color in final appearance. Flexural strength: 14,000 psi. Flame spread: 17 or less per U.L. 723 and ASTM E84-80. Baffle must be same material as liner. Metallic baffles, brackets or supports on hood interior—are acceptable. Liner and baffle material ***must*** meet 1.03 performance test. Independent test validation is mandatory.

H. Baffles: Baffles providing controlled air vectors into and through the fume hood must be fabricated of the same material as the liner. Provide minimal exhaust slots

full height on vertical sides of the baffle. High performance two 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. Baffles with manual or automatic adjustment are not acceptable. All baffles, supports, and brackets to be non-metallic.

I. Auto-Sash: Sash shall be designed to promote usage as an upper body and face shield. Face velocities and volumes shall be based on an 18" operating opening. Sash shall have the capability to be raised to full 28.5" vertical opening for loading or unloading of large apparatus. A lock-open shall be provided. Sash shall lower automatically to the operating position or lower when released from any position above 18". Auto-sash function shall be life cycle tested and not incorporate the need for motor drives. Submit third party validation of life cycle tests.

J. Service fixtures and fittings [specified option]: Color-coded hose nozzle outlets and valves mounted inside the fume hood and controlled from the exterior with color-coded index handles.
   1. Valves: Needlepoint with self-centering cone tip and seat of hardened stainless steel. Tip and seat shall be replaceable.
   2. Provide piping for all service fixtures from valve to outlet: Galvanized iron or copper for water, air and vacuum; black iron for gas services.
   3. Fixtures exposed to hood interior: Brass with chemically resistant color-coded powder coating.
   4. Remote control handles: Four-arm handle with nylon color-coded index buttons.
   5. Services: As shown or specified.

K. Service fixtures and fittings:
   [Specifier Option]
   1. Service treatment: Fittings are to be coated with a chemically resistant polyester powder lacquer electrostatic ally applied and backed on for a uniform finish.
   2. Handle and outlet nozzle will be color coded to the media. Outlet nozzles shall be made of the same high quality brass as the valve bodies. Other materials may be in contact with media where appropriate.
   3. Provide piping for all service fixtures from valve to outlet: Galvanized iron or copper for water, air and vacuum; black iron for gas services.
   4. Fixtures shall incorporate quick connect compression fittings on the valve body (for the media inlet and media outlet) as well as the fume hood outlet nozzle. With this system ***no soldering or brazing should be required to complete mechanical connections.***
   5. Fixtures exposed to fume hood interior shall have a chemical resistant finish.
   6. Fixtures are to be provided with easy to mount attachment device for secure mounting in deck or wall mounted applications. System to be installed with

simple hand tools.

7. Fittings are to be constructed to operate with the following ***maximum working pressure*** without leak or failure.
    - Water Fittings: 145 PSI
    - Non-Burning Gas: 145 PSI
    - Burning Gases: 100 PSI
    - Special Water Fittings: 145 PSI
    - Oxygen Fittings: 145 PSI
8. All outlets shall have detachable, serrated nozzles.

L. Hood light fixture: Two lamp, rapid start, UL listed fluorescent light fixture with sound rated ballast installed on exterior of roof. Provide safety glass panel cemented and sealed to the hood roof.
1. Interior of fixture: White, high reflecting plastic enamel.
2. Size of fixture: Largest possible up to 48" for hoods with superstructures up to seven feet. Provide two 36" fixtures for hoods with eight-foot superstructures.
3. Include lamps with fixtures. Hoods without lamps are not acceptable.
4. Illumination: Per performance values, Part 1 of this Section.
5. Access to light thru lintel panel—no tools required.

M. Electrical services: Three wire grounding type receptacles rated at 120 V.A.C. at 20 amperes. Provide 250 V.A.C. receptacles where specified. Flush plates: Black acid resistant thermoplastic.

N. Work surfaces: 1-1/4" thick surface, dished a nominal 3/8" to contain spills. (Molded resin work surfaces for hoods with Polyresin liners.)

O. Paper Screen: Consists of cold rolled expanded metal and applied with Electro statically applied finish to prevent corrosion. The expanded metals are 18 gauge with spacing not to exceed 1-1/4".

P. Safety Monitor/Alarm System [specified option]:
Where shown or specified, provide Safety Monitor/Alarm System, which monitors face velocity and provides audible and visual alarm if face velocity drops below safe levels. As the internal fume hood pressure changes while the sash is closed and opened, the flow passing over the thermistor is calibrated to a face velocity, which is displayed on the monitor front.
1. Safety monitor: UL listed, tamper proof, with all alarm circuits, electric components, external tubing, and manifolds furnished complete and factory installed.
2. ***Calibration is the responsibility of the owner*** and is required once the hood is stationed and the hood exhausts and room supply systems are balanced. A

secondary calibration has been factory set into the alarm's memory only to determine that the alarm is functional and ready for shipment. ***The primary calibration must be completed in the field*.**

3. Airflow sensor: Thermally compensated glass-beaded thermistor, factory connected to a sidewall port on the interior of the fume hood.
4. Alarm Signal: Audible and visual signal.
   a. Silence pushbutton, which disables the audible alarm, shall be accessible on the front of the safety monitor.
   b. Provide alternate mode in which audible alarm is silenced indefinitely but visual alarm remains activated until the alarm condition is corrected.
   c. When alarm conditions are corrected and face velocity and volume return to specified levels, the Safety Monitor will automatically reset and begin routine monitoring.
5. Provide test circuit to verify proper Safety Monitor operation.

2.04 RESTRICTED BYPASS FUME HOODS

A. Bypass shall be sufficient in size to allow 25% flow with sash closed. Bypass must be achieved through low resistance opening at top of front lintel panel. Bypass shall be designed to provide a smooth down flow effect.

B. Sashes available are: vertical rising and combination (Framed vertical rising sash with sliding glass panels that open horizontally. Horizontal only is a special.

C. Width: [48"] [60"] [72"] [96"].

2.05 BYPASS TYPE FUME HOODS

A. Constant volume with built-in automatic compensating bypass to maintain constant exhaust volume regardless of sash position.

B. Bypass: Positive in action and controlled by the sash operation.

C. Low resistance opening at top of front lintel panel. Bypass shall provide a smooth down flow effect.

D. As sash is lowered to 6", bypass design shall limit the increase in face velocity to maximum of three times the average face velocity with the sash full open.

E. Width: [48"] [60"] [72"] [96"]

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation:
   1. Install fume hoods and equipment in accordance with manufacturer's instructions.
   2. Install equipment plumb, square, and straight with no distortion and securely anchored as required.
   3. Secure work surfaces to casework and equipment components with material and procedures recommended by the manufacturer.

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

3.02 FIELD QUALITY CONTROL TESTING OF FUME HOODS

A. Field testing requirements:
   1. Use only qualified personnel to perform tests in field to verify proper operation of the fume hoods before they are put in use.
   2. Perform tests after installation is complete, the building ventilation system has been balanced, all connections have been made, and written verification has been submitted that the above conditions have been met.
   3. Verify that the building make-up air system is in operation, the doors and windows are in normal operating position, and that all other hoods and exhaust devices are operating at designed conditions.
   4. Correct any unsafe conditions disclosed by these tests before request of test procedures.

B. Testing equipment:
   1. Properly calibrated hot wire thermal anemometer equal to Alnor Model No. 8500D-1 Compuflow.
   2. Supply of 30-second smoke bombs.
   3. Supply of titanium tetrachloride.

C. Test procedure
   1. Check room conditions in front of fume hood using a thermal anemometer and a smoke source to verify that the velocity of cross drafts does not exceed 20% of the specified average fume hood face velocity. Eliminate any cross drafts that exceed these values before proceeding.
      a. CAUTION: Titanium tetrachloride fumes are toxic and corrosive. Use

sparingly; avoid inhalation and exposure to body, clothing and equipment that might be affected by corrosive fumes.

b. NOTE: No fume hood can operate properly if excessive cross drafts are present.

2. Perform the following test to verify conformance of actual fume hood face velocities to those specified. Turn on the exhaust blower with the sash in full open position. Determine the face velocity by averaging the velocity of six readings taken at the fume hood face: at the centers of a grid made up of three sections of equal area across the top half of the fume hood face and three sections of equal area across the bottom half of the fume hood face. **If not in accordance with specifications, refer to manufacturer's Troubleshooting Guide for aid in determining cause of variation in airflow.**
3. Check sash operation by moving sash through its full travel. Verify that sash operation is smooth and easy, and that vertical rising sash shall hold at any height without creeping up or down.

D. Field testing of airflow in fume hoods:

1. Turn fume hood exhaust blower on. With sash in the open position check airflow into the fume hood using a cotton swab dipped in titanium tetrachloride or other smoke source. Verify that airflow is into the fume hood over the entire face area by a complete traverse of the fume hood 6" inside the face. Reverse flow is evidence of unsafe conditions. Take necessary corrective actions and retest.
2. Move a lighted smoke bomb throughout the fume hood work area directing smoke across the work surface and against the sidewalls and baffle. Verify that smoke is contained within the fume hood and rapidly exhausted.
3. Calculate exhaust volume from face velocity data as determined above. Determine face velocity and exhaust volume with the auxiliary air blower off, in accordance with SEFA 1-2002.
4. With sash in the open position check airflow into the fume hood using a cotton swab dipped in titanium tetrachloride or other smoke source. Verify that airflow is into the fume hood over the entire face area by a complete traverse of the fume hood 6" inside the face. Reverse flow is evidence of unsafe conditions. Take necessary corrective actions and retest.
5. Ignite smoke bomb at the source of auxiliary air and observe the flow of smoke/air down the face and into the hood. Close sash and observe flow patterns. Verify that operation is safe and proper.
6. Move a lighted smoke bomb throughout the fume hood work area directing smoke across the work surface and against the sidewalls and baffle. Verify that smoke is contained within the fume hood and rapidly exhausted.

3.03 ADJUSTING

A. Repair or replace defective work, as directed by [Architect] [Owner] upon completion of installation.

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

3.04 CLEANING

Clean equipment, touch up as required.

3.05 PROTECTION OF FINISHED WORK

A. Provide all necessary protective measures to prevent exposure of equipment to other construction activity.

B. To prevent hoods from damage by work of other trades, advise contractor of necessary precautions.

END OF SECTION