

**Part 1 General**

**1.1 DESCRIPTION**

- .1 This section includes chemical (general purpose) hoods in designs and configurations specified hereunder.

**1.2 DEFINITIONS**

- .1 Chemical or General-Purpose Hoods:
  - .1 **LOW-VELOCITY HOOD:** A high-performance hood that yields energy savings by reducing the sash opening and the corresponding exhaust volume, while maintaining safe containment levels with the sash raised for set-up and face velocity as low as 60fpm.

**1.3 STANDARD FUME HOOD PERFORMANCE REQUIREMENTS**

- .1 Fume hoods shall be belted counterweight sash / aerodynamic entry design to insure maximum operating efficiency. Sash and air entry framework of the hood shall minimize eddying of air currents at the hood face and Cartesian rear baffle system shall minimize turbulence and vortexes in all portions of the hood interior.
- .2 Variable Air Volume (VAV) Fume Hood:
  - .1 VAV Fume Hood designed to yield 60 FPM face velocity at 457mm sash opening.
  - .2 Sash auto-return feature shall return the sash to 457mm if opened wider.
  - .3 A full-open sash latch to facilitate fume hood set-ups.
  - .4 Notched belt and sprocket sash system.
  - .5 Sash stops at 457mm sash opening.
- .3 Factory Test Method:
  - .1 The hood shall be tested per the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Standard 110-1995.
- .4 Location of Tests and Test Facility:
  - .1 The test facility shall meet the following requirements:
    - .1 The test facility shall have sufficient area so that a minimum of 5 feet of clear space is available in front of and on both sides of the hood for viewing tests.
    - .2 The facility's ventilation system shall have adequate heating and air conditioning so that room air temperatures can be maintained within the desired ranges.
    - .3 Standard room air currents in the test area shall be less than 15 FPM.
    - .4 The hood exhaust system shall be properly calibrated so that the desired exhaust air volumes can be easily attained.
    - .5 Make-up air to the test room shall be ceiling-supplied as in a standard chemical laboratory.

- .5 Instrumentation, Equipment and Test Personnel:
  - .1 Qualified personnel to perform the tests shall be supplied by the bidder. Instrumentation and equipment required shall be supplied by the bidder at their expense. Required instrumentation shall include but not be limited to the following items:
    - .1 Thermal anemometer capable of measuring air velocities from 10 to 600 ft./minute.
    - .2 One-half minute smoke candles or other source of high volume smoke.
    - .3 Smoke tubes or other source of localized smoke.
    - .4 Miran 103 analyzer calibrated to indicate concentration of sulfur hexafluoride or equivalent.
    - .5 Flowmeter - 15 L/minute capacity.
    - .6 Tank of sulfur hexafluoride with a two-stage regulator or other tracer gas suitable for detector to be used.
    - .7 Adjustable mannequin, 1524mm to 1727mm in height, with reasonable human proportions and arms hanging at its side.
    - .8 ASHRAE 110-1995 tracer gas ejector.
- .6 Standard 110-1995 Test (VAV hoods):
  - .1 Hood should be tested with the sash at the maximum opening 711mm, with a face velocity that corresponds to the volume indicated. The hood shall have a performance rating in the static portion of ASHRAE 110-1995 (Section 7.1-7.10) of AM 0.01 or better wherein:
    - .1 4.0 = tracer gas release in liters/minute
    - .2 AM = as manufactured
    - .3 0.01 = 5 minute time average level of control of tracer gas in parts per million (PPM)

#### **1.4 QUALITY CONTROL**

- .1 All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.
- .2 Electrical Components and Devices: UL listed and labeled for intended use.

#### **1.5 SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Manufacturer's Literature and Data: Include the following:
  - .1 Illustrations and descriptions of laboratory fume hoods and factory-installed devices for fume hoods.
  - .2 Catalog or model numbers for each item incorporated into the work.
  - .3 Static-pressure losses and exhaust volumes for fume hoods.
  - .4 Manufacturer's Data:
    - .1 Submit manufacturer's data and installation instructions for each type of fume hood. Provide data indicating ASHRAE Standard 110.1995 has been successfully completed per section 1.02 C.

- .3 Shop Drawings: Show details of fabrication, installation, adjoining construction, coordination with mechanical and electrical work, anchorage, and other work required for complete installation.
- .4 Field Test Reports: Indicate dates and times of tests and certify test results.
- .5 Factory Test Reports: Provide manufacturer's QC checklist or other reports that indicate comprehensive factory testing has been performed, and the results of these tests have been certified.

## **1.6 APPLICABLE PUBLICATIONS**

- .1 The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- .2 American National Standards Institute / American Society of Heating, Refrigerating and Air- Conditioning Engineers (ANSI/ASHRAE): 110-1995 Method of Testing Performance of Laboratory Fume Hoods.
- .3 Scientific Equipment and Furniture Association (SEFA): 1-2005 Recommended Practices for Laboratory Fume Hoods 2-1999 Recommended Practices for Installation.
- .4 National Fire Protection Association (NFPA): 45-2011 Standard on Fire Protection for Laboratories using Chemicals.

## **Part 2 Products**

### **2.1 FUME HOODS, GENERAL**

- .1 The selected manufacturer must warrant for a period of one-year starting (date of acceptance or occupancy, whichever comes first) that all products sold under the contract referenced above shall be free from defects in material and workmanship. Purchaser shall notify the manufacturer's representative immediately of any defective product.
- .2 Accessories:
  - .1 Furnishing and delivering all service outlets, accessory fittings, electrical receptacles and switches, as listed in these specifications, equipment schedules or as shown on drawings. Fittings attached to the fume hood superstructure shall be mounted at the factory.
- .3 Fume Hood Superstructure Frame:
  - .1 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.
- .4 Fume Hood Interior Walls:
  - .1 Double wall ends, not more than 114mm wide, with sash track flush with front vertical fascia, 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.

.5 Fume Hood Airfoil:

- .1 A 12 gauge stainless 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 work surface. The foil shall assure a flow of air rearward within 13mm above the work surface at all hood operating face velocities.

.6 Fume Hood Top Panel:

- .1 Fume hood top panel shall incorporate an LV type dynamic barrier bypass providing a clean air stream behind the sash plane.

.7 Fume Hood Baffles:

- .1 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 work surface. Each baffle panel shall be easily removable from the interior, without requiring liner disassembly.

.8 Fume Hood Duct Collar:

- .1 Each fume hood up to six feet in length shall contain one (1) 305mm polyethylene (optional stainless steel) bell-mouthed duct collar in the hood roof for exhausting the hood. Fume hoods over six feet in length shall contain two (2).

.9 Fume Hood Lighting:

- .1 A one-tube, energy-efficient, T-5 fluorescent light fixture of the size given below shall be provided in the hood roof. Illumination at 330mm above the work surface shall be at least 30480mm candles.

.1 Hood Size Nominal Fixture Length

1219mm 914mm

1524mm 1219mm

1829mm 1219mm

2438mm 914mm (2 Fixtures)

- .2 The light fixture shall be isolated from the hood interior by a 6mm thick tempered glass panel sealed from the hood cavity. Fixture shall be UL listed.

.10 Fume Hood Vertical Sash:

- .1 A vertical rising sash of 6mm laminated safety glass shall be provided. The sash shall have a neutral colored polyvinyl chloride horizontal member at the top and a full-length aerodynamic aluminum handle at the bottom. 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, 13mm wide stainless steel-reinforced polyurethane notched belts that engage a sprocket shaft drive and be so configured that when lifted higher than 457mm, the sash will return to the 457mm operating position automatically. The sash shall provide a 901mm

viewing height, with a maximum opening of 711mm and shall incorporate a mechanism for latching it in the full-open position for hood set-up.

.11 Fume Hood Services:

.1 Front Mounted Remote Control Fittings:

.1 Service fitting valves shall be mounted on the hood front vertical fascia with the working components of the valve accessible from the hood exterior. Valves shall be furnished with 57mm diameter, 51mm high, round handles with color-coded index buttons and color-coded service outlet. Service outlets shall be mounted on the hood interior sidewall liner in a staggered arrangement, with the lowest outlets closest to the front, and the highest outlet closest to the rear. All plumbing fittings shall be factory installed and piped between the valve and the outlet.

.2 Electrical System: 115 V, 1 phase, 60 Hz.

.3 Finish:

.1 Fixtures, Handles, and Escutcheons: Polished chrome plate.

.2 Fixtures Inside Hoods: Acid- and solvent-resistant coating applied by fixture manufacturer.

.12 Fume Hood Electrical Fixtures (Base):

.1 The hood superstructure shall be pre-wired and contain a UL label certifying acceptable wire gauge, connections, fixtures and wire color-coding. Electrical fixtures shall consist of two duplex receptacles and a light switch. The duplex receptacles shall be 20 amp, 125 volt AC, and 3-wire polarized grounded with ground fault interruption. The receptacles shall be specification grade, side wired only, to insure a positive connection. The light switch shall be 20 Amp, 125 volt AC, and 3-wire polarized grounded.

Wiring shall terminate in one 152mm x 152mm x 102mm service junction box located on the fume hood roof. Final wiring and circuit dedication shall be by others.

.13 Hood Work surface:

.1 Black Epoxy Resin:

.1 Hood work surface shall be 32mm thick molded epoxy resin made in the form of a watertight pan, not less than 10mm deep to contain spillage with a 152mm wide safety ledge across the front edge. Top shall be manufactured at the same manufacturing location as the fume hood to assure proper cutout alignment and coordinated shipping.

A cup drain flush with the recessed work surface shall be provided. The work surface and cup drain shall be available in either black or grey. The nominal 76mm X 152mm cup sink shall be of an anti-splash design with a horizontal rear outlet not extending more than 178mm below the work surface.

.14 Access Opening:

.1 The interior end liner panels shall be furnished with a triangular shaped 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.

.15 Fume Hood Dimensions:

- .1 Double wall end panel thickness shall not exceed 114mm. Interior clear working height shall be not less than 965mm 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 610mm. The sash opening shall be not less than 711mm in height above the work surface on bench hoods.

.16 Fume Hood Liners:

- .1 Stainless Steel Lining:
  - .1 Interior liner panels shall be 16 gauge Type 316 stainless steel with a No. 4 finish. Interior liner panels shall be fastened using stainless steel screws.

**2.2 FUME HOOD BASE CABINETS**

.1 Stainless Steel:

- .1 Unless otherwise indicated base units under hoods shall be fabricated of Type 316 stainless steel. Gauges of steel used in construction shall be 18 gauge except as follows:
  - .1 Corner gussets for leveling bolts and apron corner braces, 12 gauge.
  - .2 Hinge reinforcements, 14 gauge.
  - .3 Top and intermediate front horizontal rails, apron rails and reinforcement gussets, 16 gauge.
  - .4 Door assemblies and adjustable shelves, 20 gauge.
  - .5 Exposed surfaces: No. 4 satin finish.

**2.3 SPECIAL PURPOSE CABINETS FOR USE UNDER FUME HOODS**

.1 Acid Storage Cabinets:

- .1 Where indicated acid storage cabinets shall use the same gauges of steel and construction features as other base cabinets. In addition, they shall have a one-piece liner insert made of linear low-density polyethylene. The liner insert shall form a 25mm pan at the bottom to retain spillage. Each door will have a set of louvers at the top and bottom. The door shall be lined with a polyethylene sheet. Each cabinet shall be vented into the fume hood with a 38mm vent pipe, providing a positive airflow directly into the fume hood exhaust system.

.2 Solvent Storage Cabinets:

- .1 Solvent storage cabinets shall be FM labeled and specifically designed for the storage for the storage of flammable and combustible liquids. Construction shall be based upon the requirements listed by UFC, OSHA, and NFPA No. 30 - 2003.  
The bottoms, top, sides and doors shall be fabricated of 18 gauge stainless steel and shall be all double panel construction with a 38mm air space between panels. All joints shall be welded, or screwed, to provide a rigid enclosure.

The doors shall swing on full-length stainless steel piano hinges and shall be fully insulated. The right hand door shall be equipped with a three point latching device and the left-hand door shall have a full height astragal. The doors shall be self-closing and synchronized so that both doors will always fully close. The right hand door shall be equipped with a three-point latching system that automatically engages when the doors close. Each door shall be equipped with a fusible-link hold-open feature that will ensure the door closes should the temperature outside the cabinet exceed 165 degrees Fahrenheit. Units 610mm long shall have only one door, self-closing, and equipped with a three-point latching system and hold-open feature. A 51mm deep liquid tight pan that covers the entire bottom of the cabinet shall be furnished to contain liquid leaks and spills. A full-depth adjustable shelf shall also be provided. The shelf shall be perforated to allow air circulation within the cabinet. Two diametrically opposed vents with spark screens shall be provided in the back of the cabinet as well as a grounding screw. The cabinet shall have an interior finish the same as the exterior and shall be labeled: "FLAMMABLE - KEEP FIRE AWAY".

## **2.4 DIGITAL FACE VELOCITY ALARM SYSTEM – BY CONTROLS CONTRACTOR**

- .1 Not Applicable.

## **Part 3 Execution**

### **3.1 SITE EXAMINATION**

- .1 The Departmental Representative shall certify building conditions conducive to the installation of a finished goods product, including all critical dimensions.

### **3.2 INSTALLATION**

- .1 Preparation:
  - .1 Prior to beginning installation of fume hood, check and verify that no irregularities exist that would affect quality of execution of work specified.
- .2 Coordination:
  - .1 Coordinate the work of the Section with the schedule and other requirements of other work being performed in the area at the same time both with regard to mechanical and electrical connections to and in the fume hoods and the general construction work.
- .3 Performance:
  - .1 Install fume hoods, plumb, level, rigid, securely anchored to building and adjacent furniture in proper location, in accordance with manufacturer's instructions and the approved shop drawings. Provide filler panels between top of hood and ceiling. Securely attach access panels but provide for easy removal and secure reattachment. Do not install any damaged units.
- .4 Adjust and Clean:
  - .1 After installations are complete, adjust all moving parts for smooth operation.

- .2 Remove all packing materials and debris resulting from this work, and turn over the fume hoods to the Department Representative clean and polished both inside and out.
- .3 Repair or remove and replace defective work, as directed by Department Representative upon completion of installation.
- .5 Protection:
  - .1 Provide reasonable protective measures to prevent casework and equipment from being exposed to other construction activity.
  - .2 Advise Department Representative of procedures and precautions for protection of material, installed laboratory casework and fixtures from damage by work of other trades.
- .6 Certification:
  - .1 Certified Testing Agent shall field test all of the installed units using MD15128.
  - .2 Project substantial completion shall be withheld until all required fume hood certification letters, tests, and reports have been submitted to and approved by the Departmental Representative.

**END OF SECTION**