

## **SECTION 115313 – LABORATORY FUME HOODS**

Latest Edition: 5.16.16. Note all prior edits are included. See Underlined Text for latest edits.

(Engineer shall edit specifications and blue text in header to meet project requirements. This includes but is not limited to updating Equipment and/or Material Model Numbers indicated in the specifications and adding any additional specifications that may be required by the project. Also turn off “Underlines”.)

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. This Section includes the requirements for general purpose and/or special purpose laboratory fume hoods including the following:

**<A/E to Edit or Project Requirements>**

1. Metal general purpose low flow fume hoods
2. Metal special purpose fume hoods
3. Metal base cabinets
4. Factory mounted mechanical and electrical accessories

#### **1.3 COORDINATION**

- A. Provide close coordination of pre piping and pre wiring with the trades connecting to this work.
- B. Cooperate with such trades to assure the steady progress of all work under the Contract.

#### **1.4 RELATED WORK**

- A. Carefully examine all of the Contract Documents for requirements which affect the work of this section. Other specifications sections which directly relate to the work of this section include, but are not limited to, the following:

1. Specification Section - Metal Fabrications; Unistrut framing.
2. Specification Section - Rough Carpentry; concealed blocking.
3. Specification Section – Wood Laboratory Casework for epoxy material.
4. Mechanical Specifications - Mechanical connections; provision for all plumbing and HVAC services to the hood; providing valves and escutcheons not limited to water and vacuum, installation of all needed piping and fittings for valves supplied loose with fume hoods and fume hood assembly.
5. Mechanical Specifications - Provision for hood display panel, sash position sensor and all other hood control components.

6. Electrical Specifications - Electrical connections; provisions for all electrical services to the hood providing power receptacles, lights, light switch and installation of all devices supplied loose with fume hoods.

## 1.5 QUALITY ASSURANCE

- A. Installer: The fume hood manufacturer or its authorized representative.
- B. Source: Provide each type of fume hood which is the product of one manufacturer. Provide secondary materials which are acceptable to the manufacturers of primary materials.
- C. General Performance: Design fume hoods so that, when connected to exhaust system that provides proper exhaust volume under normal laboratory conditions, fume hoods will operate in safe and efficient manner, and within acceptable tolerances for face velocities specified. Dead air pockets and reverse air currents are not permitted along surface of hood interiors.
  1. Flow Visualization: Passed.
  2. Face Velocity Measurements: Hood shall maintain an average face velocity as scheduled, with every test measurement within 20% of the average.
  3. Trace Gas Test: Hood shall provide a rating of 4 AM 0.05.
- D. Control Tests: The manufacturer shall provide documentation that the fume hoods have been tested and have passed the ASHRAE 110 Latest Edition “Method of Testing Performance of Laboratory Fume Hoods.” The control test, testing facility, necessary instrumentation, apparatus and equipment will be supplied by manufacturer at no added cost to the Owner.
- E. Asbestos Materials: Do not use any materials containing asbestos in any part or component. Equipment shall be completely free of asbestos material.

## 1.6 SUBMITTALS

- A. General Requirements: For general submittal requirements see Division 01 Specification Section “Submittals”.
- B. Action Submittals:
  1. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations for materials and fixtures used, electronically in a single a “pdf” file. Provide certifications stating that materials comply with requirements.
- C. Shop Drawings:

1. Provide large scale shop drawings for fabrication, installation and erection of all parts of the work. Indicate the locations of all utility terminations for connection to the building services. As measured from the side and back surfaces, dimension the locations of each utility and identify each utility with a tag.
2. Provide plans, elevations, and details of anchorages, connections and accessory items.
3. Provide installation templates for work installed by others.
4. Show service run spaces, location and type of service fixtures.
5. Show locations of access doors, shut offs and junction boxes.
6. Provide rough-in information for all services and utility connections.

D. Closeout Submittals:

1. Test Reports: Submit certified test reports for performance required.
2. Provide documentation identifying replacement parts for factory installed mechanical and electrical devices.

E. Initial Selection Samples:

1. Submit samples showing complete range of colors, textures, and finishes available for each material used.

## 1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from all possible damage. Sequence deliveries to avoid delays, but minimize on-site storage.

## 1.8 WARRANTY/GUARANTEE

- A. All materials, equipment and accessories provided by this section shall be warranted and guaranteed to be free from defects in workmanship and materials for a period of two (2) years from the date of substantial completion and acceptance of work by UMB. Any defects in workmanship, materials, or performance which appear within the guarantee period shall be corrected by the contractor without cost to the owner, within a reasonable time, to be specified by UMB. In default thereof, owner may have such work done and charge the cost of same to the contractor.

## **PART 2 - PRODUCTS**

### 2.1 GENERAL REQUIREMENTS

- A. General: Provide general purpose low flow and/or special purpose fume hoods in the lengths and locations indicated on the drawings and as specified.

- B. General Purpose Low Flow Fume Hoods: The basis of design is a constant volume low flow standard bench fume hood, Safeguard Series Bench Fume Hood Vertical Sash Model [Insert Model Number(s)] manufactured by Mott Manufacturing Limited. < Insert the model number(s) for the appropriate hood size as follows 48 inch = 7271040, 60 inch = 7371040, 72 inch = 7471040, 96 inch = 7571040>
1. Other Acceptable Manufacturers: Subject to compliance with requirements products by one (1) of the following manufacturers are also acceptable:
    - a. Model HBASV – Lab Crafters
    - b. Model H05K54XX – Kewaunee Supreme Air Fume Hood
    - c. Model 100X – Labconco
    - d. Model 54L3589PPF – Hamilton Scientific Mistral
- C. Special Purpose Fume Hoods: The basis of design is a Pro Series Perchloric Acid and/or Pro Series Radio Isotope constant volume standard bench fume hood, Model's 7x27000 and/or 7x28000 manufactured by Mott Manufacturing Limited. <Edit for project or Delete if not Required>
1. Other Acceptable Manufacturers: Subject to compliance with requirements products by one (1) of the following manufacturers are also acceptable:
    - a. Model HBPVx – Lab Crafters Perchloric Acid Hood
    - b. Model H25L-00 – Kewaunee Perchloric Acid Hood
    - c. Model HBIVx – Lab Crafters Isotope Hood
    - d. Model H20S-00 – Kewaunee Isotope Hood
    - e. Model XXXX – Labconco Perchloric Acid Hood
    - f. Model XXXX – Labconco Isotope Hood
    - g. Model 54L3793KF – Hamilton Scientific Perchloric Hood
    - h. Model 54L2733K – Hamilton Scientific Isotope

## 2.2 GENERAL PURPOSE LOW FLOW FUME HOODS

- A. Design and Air Foils: Provide fume hoods of the airfoil design with radiused or angled foil sections at the bottom and along both sides of the hood face opening. The horizontal foils shall be flush with the hood work surface to minimize turbulence as air enters the hood. Air foil shall be hinged and epoxy powder coated type 316 stainless steel. Slotted type bypass or louvered bypass grilles are acceptable.
- B. Wall Construction: Provide double wall construction to enclose all structural reinforcements, sash and balance mechanisms and mechanical connections for service outlets and controls. Do not provide any enclosing soffits at the top of the double wall [both] side walls. These areas shall remain open for the inspection and maintenance of the sliding sash operating mechanism and also for the installation of mechanical services. Provide five (5) inch maximum thickness of overall side panel.

- C. Hood Interior Lining and Superstructure: Provide minimum 0.188 inch thick non-asbestos, high density, bright white color glass fiber reinforced polyester sheet material. End panels, back panel, access panels and top panel shall be screwed together with steel angles or cleats to form a completely rigid assembly to which exterior parts can be mounted. Baffles shall be fixed position of the same material as the liner.
- D. Fascia Panels and Filler Panels: Punch hood fascia panels to receive only the controlled service fittings, electrical switch devices, and automatic temperature control devices required at each side of hood. Provide formed sheet metal closures to fill gaps between hoods and adjacent construction where indicated and at all one quarter (1/4) inch to six (6) inch gaps between hoods and adjacent construction. Finish all fascias, fillers and attachment devices to match fume hood.
- E. Hood Exterior: Fabricate hood exterior from minimum 18 gauge cold rolled steel. Screw all components parts together with stainless steel screws to allow removal of end panels, fascias, grilles and air foils to permit replacement and to provide access to interior services and utility lines. Reinforce main hood exterior elements as needed to create stiff, stable assemblies. Provide specified finish on all exposed and concealed surfaces after fabrication and before final assembly. Do not provide capped holes at unused valve positions. Provide factory cut prepared holes for mechanical and electrical service fittings and related piping, conduits, wiring and other related work including holes for cover plates and holes in loose structure, holes in interior hood working surface, holes in hood superstructure and holes in base cabinets, except for rear service strip filler panel.
- F. Access Panels: Provide access to electrical junction boxes, lighting fixtures for service and re-lamping, all service lines and fittings and all other components and accessories requiring service, maintenance or adjustment. Make access panels located on the outside of the hood removable and re-installable without interference with or removal of any ceiling or any adjoining work. Provide removable access panels held in place with extruded vinyl gaskets in the interior of the hood to permit installation of various mechanical devices and connections.
- G. Baffles: Provide removable baffles constructed of the same material as the liner.
- H. Vertical Sliding Sash: Provide vertical sliding sash of seven thirty second (7/32) inch thick laminated safety glass within aerodynamic powder coated steel sash frame with no visible joints. Provide vinyl glazing gaskets which interlock with the glass retainer and seal glass to frame with an extruded vinyl channel. Counterbalance sash with metal counterbalancing weights suspended by geared chain driven assembly or stainless steel reinforced nylon belt and gear.
- I. Sash Guides: Provide plastic sash guides to prevent metal-to-metal contact set into Type 316 stainless steel sash guides enclosure. Provide continuous grip at sash.

- J. Sash Lowering Device: Bench hoods shall be equipped with a sash lowering device designed to lower the sash when released to below the safe working height of eighteen (18) inches. Sash shall operate normally below that height.
- K. Hood Ceiling Closure Panel: Provide, where indicated on the drawings, painted steel panels, matching adjacent hood and forming a parapet across the front and sides of all hoods where exposed to room, aligned with top of adjacent hoods as applicable. Panels to be removable, hood by hood, by fasteners concealed behind; and extend two (2) inches above the ceiling, typically. Brace panels so that a continuous flush surface is maintained. Installer shall ensure that the open top of the fume hood enclosure is closed and that transfer of air out of the ceiling space is prevented.
- L. Working Surface: Provide work surface as follows: <Verify with University work surface material, retain 'a' or 'b' below. If both are in a project, provide a fume hood schedule on drawings. Retain 'c' below>
- a. Epoxy resin to match Epoxy Resin Countertops as specified in Division 06 or 12 Section for Wood Laboratory Casework.
  - b. Provide 12 gauge minimum Type 316 stainless steel working tops fabricated into a one quarter (1/4) inch Type 316 stainless steel deep watertight pan with a raised flat area all around the recessed pan area as indicated on drawings.
  - c. Provide safety ledge across the front of the work surface. In lieu of 12 gauge material, provide at contractor option: 16 gauge material reinforced on the underside with full length welded hat sections.
  - d. Provide plugs for unused holes in the hood work surfaces and posts.
  - e. Where acid store cabinets are utilized provide factory drilled hole(s) for venting the cabinet.
  - f. Where interior walls meet the work surface caulk all joints.
- M. Epoxy Cup Sinks: Cup sinks shall be three (3) inch x nine (9) inch epoxy with inside dimensions and shall be neatly formed into working surfaces and make seams between sinks and working surface invisible and watertight. Facing the fume hood locate the cup sink on the side of the fume hood adjacent to the casework. See construction drawings for the location of the fume hoods and adjacent casework.
- N. Experiment Rack: Where indicated for bench fume hoods, provide stainless steel rod system (monkey bars) fastened to the rear surface of the hood compartment with stainless steel screws. <Verify with the University if Experiment Racks are required, delete if not required.>
- O. Packaged Chilled Water Units: For owner furnished chilled water units provide openings for tubing. Openings shall be two (2), one (1) inch inside diameter finished round holes in raised flat area of working surface as shown on drawings. <Verify with the University if Packaged Chilled Water Units are required, delete if not required.>

## 2.3 BASE CABINETS

- A. Base Cabinets: Where indicated, provide metal base cabinets thirty four and three quarters (34-3/4) inch high and twenty two (22) inch deep base cabinets. Provide twenty four (24) inch, thirty (30) inch, thirty six (36) inch, and forty eight (48) inch wide cabinets as indicated. Provide matching side panels to close visible gaps between rear of cabinet and rear wall. For all cabinets, provide an equal height fixed apron rail above the doors, rail shall properly accommodate recessed electrical devices indicated. Recess the rail about one (1) inch behind the face of the cabinet. Make rails easily removable from the front to permit installation of devices behind the rail. Base cabinets shall be one (1) of the following:

<Verify with University type(s) of cabinets to be used, edit below for project. If base cabinets vary within one project, provide fume hood schedule on drawings.>

1. Flammable Storage Cabinet: Provide cabinets specifically designed for the storage of flammable and combustible liquids and which comply with NFPA 30, and requirements of authorities having jurisdiction. Completely close-off area behind the rail from the cabinet storage area. Fabricate cabinet from minimum 18 gauge steel with double end walls and with one and one half (1-1/2) inch air space between the wall layers. Weld or fasten joints to provide rigid enclosures. Provide piano hinged doors with three (3) point latching. Provide full height astragals on the entire bottom of the cabinets. Provide heavy-duty shelves with supplemental reinforcing at all edges and in the center on the bottom. The letters "Flammable Storage" shall be embossed or stenciled on the doors to the cabinet. Provide a removal access panel in the back of the apron rail for access to acid waste roughin connection for cup sink
2. Corrosive Storage Cabinet: Corrosive storage units shall utilize the same gauges of metal specified above, except that they shall be completely lined with a corrosion resistant FRP liner. Provide a removal access panel in the back wall for access to acid waste roughin connection for cup sink.
  - a. Provide a removable plastic tray recessed in the bottom of the cabinet to contain spills.
3. Vented Packaged Chilled Water Unit Cabinets: Provide cabinets by same manufacturer as hoods with integral door louvers. Provide factory prepared cutouts as needed for electrical connections and piping openings into the working hood above. Coordinate vent connection hole size with the HVAC contractor based on the heat output of the intended chiller. Ductwork and connections by others. <Delete if not required>

## 2.4 FINISHES

- A. Finish: For all exposed and concealed metal surfaces on both fume hoods and cabinets, provide a complete factory applied, oven baked, rust and chemical resistant epoxy enamel finish system after sub-assemblies have been fully welded and fabricated. Meticulously prepare surfaces before painting by inhibited chemical cleaning, conversion coating and

priming in compliance with coating manufacturer's instructions and recommendations. Apply coatings by electrodeposition or electro- static spray. Create uniform final finishes matching approved samples.

- B. Color: Provide colors as selected by Architect from manufacturer's complete range of standard and/or custom color options. There shall be no limit on the number of standard colors. More than one color may be required.
- C. Finish System Performance - Chemical Spot Testing: Provide complete finish system which exhibits no visible effect other than increase in gloss when tested with the following reagents [percentages by weigh] for sixty (60) minutes. Separately space ten (10) drops of each reagent on the surface to be tested and cover with a watch glass convex side down, except for volatile solvents, apply the reagent with a cotton ball covered with an inverted two (2) ounce bottle. Keep tested surface wet throughout the test and upon completion of the test, wash the tested area with soap and water and thoroughly dry the surface before examination and evaluation.

|     |                      |     |
|-----|----------------------|-----|
| 1.  | Acetic Acid          | 98% |
| 2.  | Sulfuric Acid        | 25% |
| 3.  | Sulfuric Acid        | 85% |
| 4.  | Hydrochloric Acid    | 37% |
| 5.  | Nitric Acid          | 25% |
| 6.  | Phosphoric Acid      | 75% |
| 7.  | Methylene Hydroxide  |     |
| 8.  | Sodium Hydroxide     | 25% |
| 9.  | Sodium Hydroxide     | 10% |
| 10. | Ammonium Hydroxide   | 28% |
| 11. | Hydrogen Peroxide    | 5%  |
| 12. | Ether                |     |
| 13. | Ethyl Alcohol        |     |
| 14. | Ethyl Acetate        |     |
| 15. | Xylene               |     |
| 16. | Acetone              |     |
| 17. | Formaldehyde         | 37% |
| 18. | Carbon Tetrachloride |     |
| 19. | Methyl Ethyl Ketone  |     |

- D. Finish System Performance - Bending Test: Provide complete finish system which exhibits no flaking or peeling when applied to an 18 gauge metal strip and bent 180°F over a one half (1/2) inch diameter mandrel.
- E. Finish System Performance - Adhesion Testing: Provide complete finish system which results in at least ninety (90) squares of the one hundred (100) square test sample remaining coating after testing in compliance with ASTM D 2197 modified with one sixteenth (1/16) inch squares cut just through the coating, brushed lightly with a soft brush and examined under one hundred (100) foot candles of illumination.



- F. Finish System Performance - Hardness Test: Provide complete finish system which exhibits a pencil hardness of at least 4H when tested with sharpened pencils of increasing hardness. The 5H pencil shall be the softest which cuts or scratches the coating.

## 2.5 REQUIREMENTS FOR PLUMBING, VENTILATION AND MONITORING

- A. General: Facing the fume hood locate the cup sink cold water faucet, acid waste, and compressed air utilities on the side of the fume hood adjacent to the casework. Locate the natural gas and vacuum utilities on the opposite side of the hood adjacent to a wall and/or partition. These plumbing services can be located either right hand or left hand depending on the location of the fume hood in the room layouts. See construction drawings for the location of the fume hoods and adjacent casework.

- B. Plumbing Service Fittings: Provide manufacturer's standard clear epoxy coating on all plumbing fittings within the hood working area except on stainless steel valves. No plastic materials or colored coatings are acceptable, except for colored valve identification buttons. All fixtures shall be chrome plated standard construction with clear epoxy coating.

1. Unit Mounted Plumbing Service Fittings: Except where noted otherwise, all unit mounted plumbing service fittings shall be wall/post mounted by Water Saver or Chicago Faucets as follows:

- a. Cold Water Gooseneck Outlet w/ Integral Vacuum Breaker: Cold Water (Wall): Water Saver L074 VB-WSA faucet
- b. Cold Water Valve: Water Saver remote valve L740W or equal.
- c. Compressed Air: Water Saver 740N with L022WSA outlet or equal.
- d. Vacuum: Water Saver 740N with L022WSA outlet or equal.
- e. Natural Gas: Water Saver 740N with L022CV-WSA outlet or equal.

- C. Ventilation Requirements and External Duct Fitting: Ventilation requirements and external duct fitting shall be as follows:

1. Ventilation Requirements: Ventilation requirements for General Purpose and/or Special Fume Hoods shall comply with the following:

- a. General Purpose Low Flow Fume Hoods: General purpose low flow fume hood exhaust requirement shall be based on exhausting a constant volume of air through an eighteen (18) inch high sash opening at eighty (80) feet per minute (fpm) with a maximum exhaust static pressure loss of 0.30 inches to 0.40 inches water gauge or less. The following face area, cubic feet per minute (CFM), and static pressures (SP) ranges are compatible for the acceptable manufacturers in paragraph 2.1 for each listed size:

<Edit 1-4 for Hood Sizes for the Project Requirements>

- 1) Forty eight (48) inch FH (4.750 – 4.875 ft.<sup>2</sup>): 380 – 400 CFM @ 0.20 inches.
  - 2) Sixty (60) inch FH (6.25 - 6.375 ft.<sup>2</sup>): 500– 520 CFM @ 0.15 inches
  - 3) Seventy two (72) inch FH (7.75 - 7.875 ft.<sup>2</sup>): 620 - 640 CFM @ 0.20 inches
  - 4) Ninety six (96) inch FH (10.75 - 10.875 ft.<sup>2</sup>): 800 – 880 CFM @ 0.30 inches
- b. Special Purpose Fume Hoods: Special purpose fume hood exhaust requirement shall be based on exhausting a constant volume of air through an eighteen (18) inch high sash opening at one hundred (100) feet per minute (fpm) with a maximum exhaust static pressure loss of 0.30 inches to 0.40 inches water gauge or less. The following face area, cubic feet per minute (CFM), and static pressures (SP) ranges are compatible for the acceptable manufacturers in paragraph 2.1 for each listed size:
- <Delete if not required>
- <Edit 1-4 for Hood Sizes for the Project Requirements>
- 1) Forty eight (48) inch FH (4.750 – 4.875 ft.<sup>2</sup>): 475 – 487 CFM @ 0.20 - 0,30 inches
  - 2) Sixty (60) inch FH (6.25 - 6.375 ft.<sup>2</sup>): 625– 637 CFM @ 0.20 - 0.30 inches
  - 3) Seventy two (72) inch FH (7.75 - 7.875 ft.<sup>2</sup>): 775 - 787 CFM @ 0.25 - 0.35 inches
  - 4) Ninety six (96) inch FH (10.75 - 10.875 ft.<sup>2</sup>): 1,075 – 1,087 CFM @ 0.30 - 0.40 inches
2. Externally Mounted Duct Connection: Provide a type 316 stainless steel rectangular exhaust outlet with a transition to round duct connection located behind the upper sloping baffle and extending two (2) inches above the top panel. Size exhaust outlet connection accordingly for the hood size. Type 316 stainless steel round duct collars are also acceptable.
  3. Vent for Corrosive Storage Cabinet: Provide a vent connection for the corrosive storage cabinet on the right or left side rear cabinet panel.
- D. Monitoring Requirements: Fume hood monitoring requirements shall be as follows:
1. Fume Hood Safety Monitor and Alarm: Provided by the BAS Manufacturer for factory installation. Coordinate with the BAS contractor for power requirements. Also see paragraphs 2.6 & 2.8 below.

2. Air Monitoring Station: Provide a cutout for the air monitoring station on the Right or Left Front Panel.

## 2.6 ELECTRICAL SERVICES

- A. General: Provide electrical services for power and lighting where indicated on the drawings. Fume hood electrical services shall include duplex receptacles, lighting fixture, and light switch mounted on the front of the fume hood.
- B. Unit Mounted Duplex Receptacle: Provide duplex GFI receptacles as shown on fume hood elevations, and coordinate requirements with the Electrical Specifications.
- C. Unit Mounted Lighting: Provide a U.L. listed and labeled twin tube 32 watt, T8, bi-pin rapid start fluorescent lighting fixture with 120V-60Hz, thermally protected solid state ballast equipped with a Class 'A' sound rating. Hinge fixture on one side for relamping and cleaning and mount fixture near top of hood setting on a fixed and vinyl gasketed one quarter (1/4) inch thick safety glass shield. Provide individual fuse holder and fuse in every lighting fixture ballast. Lamps shall be replaceable from the room side of the sash. Lamps and ballast shall not be exposed to the air within the hood.
- D. Externally Mounted Electrical Devices: All plates shall be brushed stainless steel, with receptacle plates engraved with panel and circuit designation (engraving to match that approved by Architect for plates provided under Section 16). Switch for hood light shall be full size, spec grade, AC type rated for 120/277 volts, Hubbell 1221. Duplex receptacles shall be spec grade, U ground, rated for 125 volts, 20 amp, Hubbell 5352. Device color as selected by Architect from manufacturer's full range.
- E. Fume Hood Safety Monitor and Alarm: When the fume hood safety monitor, supplied by the BAS contractor, requires 110V service provide a dedicated duplex outlet for the monitor's transformer. Coordinate with the BAS contractor for requirements.  
<If the supplied safety monitor's power supply is powered by 24 VAC through the BAS System Delete if not required >

## 2.7 MECHANICAL PRE PIPING

- A. General: Provide pre piped factory installed mechanical and within the cabinet to all required service fittings and include single termination points for each service above the cabinet for connection to field installed services.
  1. Pre-piped plumbing work shall utilize only the materials specified below and shall satisfy the requirements of all governing laws and codes.
  2. Piping Reference Standards: The following standards apply:
    - a. General Materials Appropriate ASTM Standards.
    - b. Steel Flanges ANSI B16.5.
    - c. Steel Fittings ANSI B16.9.

- d. Cast Iron Fittings and Flanges: ANSI B16.1.
- e. Malleable Iron Fittings ANSI B16.19.
- f. Code for Pressure Piping ANSI B31.1.
- g. NFPA 99 - Laboratory Gases.

B. Pre Piping Materials: Pipe materials shall be as follows:

- 1. Water Piping, Fittings and Joints:
  - a. Piping: Seamless Copper Tubing type 'L' complying with ASTM 1388-72, ANSI B88.
  - b. Fittings: Wrought copper fittings, complying with ASTM B75, ANSI B16.22. As required additional fittings may be used as follows:
    - 1) Flanges: Cast bronze, ASTM B62, 125 lb., compression joint.
    - 2) Bolts: ASTM A37, Grade B, square or hex head, 2A threads.
    - 3) Gaskets: one sixteenth (1/16) inch, red rubber, full face.
    - 4) Unions: Bronze 150 lb., solder.
  - c. Instrument Grade Double Ferrule Compression Joints: All joints in copper water tubing shall be made in accordance with Copper Development Association recommendations.
- 2. Vacuum Pipe, Fittings and Joints:
  - a. Pipe Material: Piping shall be 'ACR' Type 'L' copper hard drawn soft annealed seamless tubing.
  - b. Fitting Material: Fittings shall be wrought copper fittings matching the pipe material and complying with ANSI B16.22.
  - c. Instrument Grade Double Ferrule Compression Joints: All joints in copper water tubing shall be made in accordance with Copper Development Association recommendations.
- 3. Compressed Air Pipe, Fittings and Joints:
  - a. Pipe Material: Piping shall be 'ACR' Type 'L' copper hard drawn soft annealed seamless tubing.
  - b. Fitting Material: Fittings shall be wrought copper fittings matching the pipe material and complying with ANSI B16.22.
  - c. Instrument Grade Double Ferrule Compression Joints: All joints in copper water tubing shall be made in accordance with Copper Development Association recommendations.
- 4. Natural Gas Pipe, Fittings and Joints:
  - a. Pipe Material: Piping shall be Schedule 40 seamless black steel pipe complying with ASTM A120.
  - b. Fitting Material: All fittings shall be malleable iron threaded type fittings complying with ANSI B16.3 Class 150 threads per ANSI B1.20.1.
  - c. Threaded Joints: All joints shall be threaded per American Standard for pipe threads, ANSI B2.1.

## 2.8 ELECTRICAL PRE WIRING

- A. General: Provide pre wiring for all factory installed electrical services within the cabinet to a single termination point above the cabinet for a field connection by others.
- B. Wiring and Conduit: Wiring shall be a minimum No. twelve (12) AWG, with THHN insulation and rated for 90°C and installed in EMT conduit (steel MC cable?). A green grounding conductor shall be provided with each circuit and terminated in the junction box.
- C. Junction Box: Provide one (1), four (4) inch square, junction box located on top of the structure so the junction box is accessible, no matter what position the fume hood is located in. The junction box shall be wired for:
  - 1. General purpose receptacle, lighting fixture and switch.
  - 2. Chiller Cabinet receptacle? <Coordinate with UMB, Delete if not required>
- D. Fume Hood Safety Monitor and Alarm: When the fume hood safety monitor, supplied by the BAS contractor, requires 110V service provide one (1) duplex outlet mounted on top of the cabinet for the monitor's power supply. Coordinate with the BAS contractor for requirements. <If the supplied safety monitor is powered by 24 VAC through the BAS System Delete if not required >

## 2.9 SPECIAL PURPOSE FUME HOODS

- A. Perchloric Acid Hood: <Delete if not required>
  - 1. Interior Lining: Interior lining including end panel and back panel, shall be 14 gauge Type 316 stainless steel, with a No. 4 finish. Baffles and top panel shall be 16 gauge Type 316 stainless steel with a No. 4 finish. The duct collar shall be Type 316 stainless steel with a drip edge. The baffle shall be held in place with stainless steel screws and shall be removable to allow cleaning of the area behind the baffle. The inside back and end panels shall be made in a one-piece wrap around which is welded to the work surface, forming smooth one half (1/2) inch radius corners. All interior corners shall be one half (1/2) inch radius, including top and work surface. The entire stainless steel hood interior shall be reinforced with angles and plug hats to provide a completely rigid assembly and shall be welded together to form a self supporting assembly. The hood end liners shall not have access openings.
  - 2. Service Fittings: Service fittings shall include a remote controlled perforated spray pipe to wash down surface of hood in rear of baffle and a remote controlled water fitting. The spray pipe shall run the full length of the hood interior and shall be located above and behind the baffle. Valves for the wash down and water fitting shall be front loaded type, mounted in the vertical fascia panel. The water

fitting shall include a panel flange and angle serrated hose connector with a chemical resistant metallic bronze finish.

3. Light Fixtures: Light fixtures (bulbs not included) shall be the vapor proof incandescent type, 150 watt capacity. Fixture shall be UL approved and labeled. The number of fixtures shall be as follows:
  - a. Forty eight (48) inch hood: One (1) light fixture
  - b. Sixty (60) inch hood: One (1) light fixture
  - c. Seventy two (72) inch hood: One (1) light fixture
  - d. Ninety six (96) inch hood: Two (2) light fixtures
4. Work Surface: Work surface shall be 16 gauge, Type 316 stainless steel with a No. 4 satin finish, reinforced with steel hat channels, made in the form of a watertight pan twelve (12) inches deep to contain spillage, with a six (6) inch wide safety ledge at the front edge and an integral trough sink at the rear. The trough sink shall contain two (2) one and one half (1-1/2) inch I.P.S. outlets located eleven inches (11) inches from each outside end panel to facilitate the removal of water from the washdown system.

B. Isotope Hood: <Delete if not required>

1. Interior Lining: Interior lining, including end panels and back panel, shall be 14 gauge, Type 304 stainless steel with a No. 4 finish. Baffle and top panels shall be 16-gauge, Type 304 stainless steel with a No. 4 finish. The duct collar shall be Type 304 stainless steel. The rear baffle shall be held in place with stainless steel screws and shall be removable to allow cleaning and decontamination of the area behind the baffle. The inside back and end panels shall be made in a one-piece wrap-around which is welded to the work top, forming smooth one half (1/2) inch radius corners. All interior corners shall be one half (1/2) inch radius, except for top liner, which is spot welded to the wrap-around. The entire stainless steel hood interior shall be reinforced with angles and plug hats and shall be welded together to form a self-supporting assembly. The hood end liners shall not have access openings and the front fascia panel shall be punched to accept front loaded service fittings.
2. Work Surface: Hood work surface shall be 16 gauge, Type 304 stainless steel with a No. 4 satin finish , reinforced with steel hat channels, made in the form of a watertight pan, one half (1/2) inch deep to contain spillage, with a six (6) inch wide safety ledge across the front edge. A round cup drain mounted flush with the recessed top, shall be provided. The work surface shall be reinforced to support a uniform maximum loading of two hundred (200) pounds per square foot.

### PART 3 - EXECUTION

### 3.1 PRE INSTALLATION

- A. Pre Installation Examination Required: The installer shall examine previous work, related work and conditions under which this work is to be performed and notify Contractor in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means installer accepts substrates, previous work and conditions.
- B. Manufacturer's Instructions and Recommendations: Strictly comply with manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this section. Comply with referenced standards.
- C. Installation: Install fume hoods and cabinets plumb, level, rigid, securely anchored to building and adjacent casework in proper locations as indicated. Do not obstruct any access panels.
- D. Coordination: Coordinate installation with all other related and adjacent work including, but not limited to, mechanical, electrical, laboratory casework, equipment and other work.

### 3.2 PRE PIPING INSTALLATION

- A. General: Work may be done, in all or in part, on or off site, but must be performed according to the following requirements. The manufacturer (and subcontractor for this section, if applicable) shall certify compliance, as described under Submittals.
  - 1. Fume hood components which will be connected to the water, drain and gas systems of the building and are required by any applicable Codes to be approved by any governing agencies for use in Maryland shall have approval obtained by Hood Subcontractor in advance of fabrication.
  - 2. Pre piped plumbing work shall be factory assembled; tested and installed shall satisfy the requirements of all governing laws and codes.
  - 3. Miscellaneous Connections: Connections between pipe, fittings, hangers and equipment of dissimilar metals shall be avoided wherever practical. Wherever such connections are unavoidable, they shall be insulated against direct contact, using a high grade dielectric insulating material of Teflon, Micarta, neoprene or nylon.
  - 4. The installation of equipment and individual components shall be made in accordance with the instructions of the manufacturer. These instructions shall be submitted to the Owner and made part of the Contract Specifications.
  - 5. Capping All Piping: Cap all piping after all testing and disinfection has been completed, with tight fitting caps and/or plugs (of suitable material) intended for

such purposes. This is to keep piping clean and free of contaminants during storage, shipping and handling.

B. Pre Piping Installation:

1. Water Piping :

- a. Pipe used in piping assembly must be clean of dirt and obstructions and shall have ends squared and reamed before butting into the fittings.
- b. Cut the tube to the required length with hacksaw or tube cutter designed for copper work.
- c. Remove burrs from the inside and outside of the cut edge and clean the end of the tube with steel wool or sand cloth until all discoloration is removed and metal is smooth and bright.
- d. Oxides shall be removed by sand cloth, brush, etc.
- e. Extend a one half (1/2) inch water pipe six (6) inches above the top of the cabinet for field connection to the building service by others.

2. Vacuum Piping:

- a. All piping, valves, fittings and components for vacuum use shall be supplied, cleaned, prepared and certified for service by the manufacturer and be received sealed on the job
- b. Pipe shall be cut square. All burred ends of all piping and tubing shall be reamed to full bore of the pipe or tube and all chips shall be removed. Tools used in cutting and reaming shall be kept free from oil, grease or other lubricants. All cuts shall be cleaned and restored to original pipe dimensions. Where contamination has occurred, the items affected shall be re cleaned in accordance with NFPA 99.
- c. Extend a one half (1/2) inch vacuum pipe six (6) inches above the top of the cabinet for field connection to the building service by others.

3. Compressed Air Piping:

- a. All piping, valves, fittings and components for compressed air use shall be supplied, cleaned, prepared and certified for service by the manufacturer and be received sealed on the job
- b. Pipe shall be cut square. All burred ends of all piping and tubing shall be reamed to full bore of the pipe or tube and all chips shall be removed. Tools used in cutting and reaming shall be kept free from oil, grease or other lubricants. All cuts shall be cleaned and restored to original pipe dimensions.
- c. Extend a one half (1/2) inch compressed air pipe six (6) inches above the top of the cabinet for field connection to the building service by others.

4. Natural Gas Piping:



- a. All piping, valves, fittings and components for natural gas use shall be supplied, cleaned, prepared and certified for service by the manufacturer and be received sealed on the job
- b. Pipe shall be cut square. All burred ends of all piping and tubing shall be reamed to full bore of the pipe or tube and all chips shall be removed. Tools used in cutting and reaming shall be kept free from oil, grease or other lubricants. All cuts shall be cleaned and restored to original pipe dimensions. Where contamination has occurred, the items affected shall be re cleaned in accordance with NFPA 54.
- c. Extend a one half (1/2) inch natural gas pipe six (6) inches above the top of the cabinet for field connection to the building service by others.

5. Cup Sink Drainage Piping and Fittings:

- a. Joints shall be made by means of heat fusion joint (FUSEAL II); connections containing exposed copper wire are prohibited.

C. Pressure Testing:

1. Test all piping and fittings to the pressures and durations as follows:

- a. Test Pressures and Durations:
  - 1) Water: 150 psig for thirty (30) minutes.
  - 2) Vacuum: 150 psig for thirty (30) minutes.
  - 3) Compressed Air: 150 psig thirty (30) minutes.
  - 4) Natural Gas: 150 psig thirty (30) minutes.
  - 5) Drain: ten (10) feet head for fifteen (15) minutes.
- b. Pressure Testing Media: Test all piping and fittings with the following test media:
  - 1) Water: Potable water.
  - 2) Vacuum: Oil free nitrogen or oil free dry air (air shall have maximum pressure dew point of 35<sup>0</sup>F.)
  - 3) Compressed Air: Oil free nitrogen or oil-free dry air (air shall have maximum pressure dew point of 35<sup>0</sup>F.)
  - 4) Natural Gas: Oil free nitrogen or oil-free dry air (air shall have maximum pressure dew point of 35<sup>0</sup>F.)
  - 5) Drain: Potable water.

### 3.3 PRE WIRING INSTALLATION

- A. Requirements: Pre wired electrical devices shall meet the requirements of the National Electrical Code (NEC), latest edition.
- B. UL Standard: Each fume hood shall be listed to the UL 1805 Standard.

### 3.4 FIELD TEST

- A. Field Test: The Universities Environmental Health and Safety Department (EHS) shall field test each unit to verify the operation of hoods is accordance with specified requirements. The field testing shall be scheduled when the HVAC systems, including related controls have been installed and are operating per the CD's. The CM shall notify the University sixty (60) days prior to the date of substantial completion to schedule the fume hood tests. All deficiencies with the fume hoods, HVAC system and/or controls must be addressed and corrected by the CM prior to occupancy by the University.

### 3.5 ADJUSTING, CLEANING, TOUCH UP, PROTECTION & DEMONSTRATION

- A. Adjusting: Adjust operating parts including sash, drawers, doors and other components to work easily, smoothly and correctly.
- B. Touch Up and Repair: Touch up damaged coatings and finishes and repair minor damage to eliminate all evidence of repair; replace damaged components with new factory finished units. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer of material or product being cleaned. Remove and replace work that cannot be successfully cleaned or repaired.
- C. Protection: Provide temporary protection to ensure work is without damage or deterioration at time of final acceptance. Remove protections and reclean as necessary immediately before final acceptance.
- D. Demonstration: Provide and review maintenance manual, demonstration equipment and instruct Owner's personnel in routine maintenance and proper operation procedures.

END OF SECTION 115313