



REQUEST FOR BID
Date: 07/13/11
Bid 11-29DS

RETURN BY OPENING TIME TO:
Purchasing Division
RM 100 City Hall
411 West 1st Street
Duluth, MN 55802

Police Headquarters Lab Equipment

Buyer: Dennis Sears
Phone: 218-730-5003
Fax: 218-730-5922

BID OPENING, RM 100 AT 2:00 PM ON THURSDAY, AUGUST 4, 2011

Note: All bids must be written, signed, and transmitted in a sealed envelope, plainly marked with the bid number, subject matter, and opening date. The City of Duluth reserves the right to split award where there is substantial savings to the city, waive informalities and to reject any and all bids. Sales tax is not to be included in the unit price. Bidder to state freight charges if, proposal is F.O.B. shipping point, freight not allowed. Low bid will not be the only consideration for award of bid. All pages must be signed or initialed by authorized bidder's representative as indicated at the bottom of the page(s) of the request for bid.

OFFICIAL SEALED BID

Designated F.O.B. Point

Tax: Federal Excise Tax Exemption
Account No. 41-74-0056 K

Item No.	Qty	U/OM	Description	Unit Price	Total Price
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Please provide quotes for Police Headquarters forensics lab equipment and furniture per the attached specifications and drawings.

Vendor E-mail Address _____ Freight Charges FOB

Name _____

Total Bid Price _____
(To include any additional pages)

Addr _____

Payment Terms _____

By: _____
(print title)

F.O.B. Point Duluth

(signature) (tele#)

Delivery Date _____

All lot prices to include testing (as specified), applicable taxes, delivery and handling. The City of Duluth reserves the right to inquire about other pricing available for different models one the bid selection is made.

Bidders are to supply all back-up information on products bid, including product data, installation instructions, operational and maintenance information and warranty.

Bidders are to supply information and cost for any offered accessories or options on each product bid that are not part of the specifications and Lot bids provided. The City of Duluth reserves the right to add accessories or options to the low Lot bids as afforded.

A floor plan is provided for location of equipment in the new City of Duluth Police Department Headquarters building, currently under construction.

Lot #1: Downflow Workstation

Ductless Downflow Workstations per attached specifications.
 Base Manufacturer: Air Science
 Approved Manufacturer: Labconco (Protector Series)

	Product(s)	_____
	Installation	_____
	Total Cost	_____
Warranty period	Year(s)	_____

Lot #2: Utility Tables

Utility Lab Tables per attached specifications.
 Base Manufacturer: Thermo Scientific Hamilton
 Approved Manufacturer: Mott Manufacturing

	Product(s)	_____
	Installation	_____
	Total Cost	_____
Warranty period	Year(s)	_____

 initials

Lot #3: Forensics Cabinet

Forensics Cabinet per attached specifications.
 Base Manufacturer: Thermo Scientific Hamilton
 Approved Manufacturer: Labconco (Protector Series)

	Product(s)	_____
	Installation	_____
	Total Cost	_____
Warranty period	Year(s)	_____

Lot #4: Fume Hood

Fume Hood, work surface and base cabinets per attached specifications.
 Base Manufacturer: Thermo Scientific Hamilton
 Approved Manufacturer: Labconco (Protector Series)

	Product(s)	_____
	Installation	_____
	Total Cost	_____
Warranty period	Year(s)	_____

Lot #5: Evidence Drying Cabinets

Drying Cabinets per attached specifications.
 Base Manufacturer: Air Science
 Approved Manufacturer: Labconco (Protector Series)

	Product(s)	_____
	Installation	_____
	Total Cost	_____
Warranty period	Year(s)	_____

Total All Lots _____
 (carry to front page)

 initials

If bidding other than specified base manufacturer and product, please provide complete product data from the manufacturer illustrating compliance with technical specifications and supply contact information for two similar users of the product(s) submitted. The City of Duluth will determine if substituted product equally meets function, quality and warranty as designated product. Further documentation may be requested from Bidder. The City reserves the right to contact the references provided for additional information.

Approved Bidder(s) will provide and install all products, perform tests to make sure equipment is in working order, remove any packing or debris from the site after installation and provide warranty service as needed per the terms of the accepted warranty.

Questions regarding any lots should be directed to: Lt. Kerry Kolodge at 218-730-5639.

Questions pertaining to the bid documents should be directed to: Dennis Sears, Purchasing Agent, at 218-730-5003.

CSI LAB EQUIPMENT SPECIFICATIONS

LOT #1 - DUCTLESS DOWNFLOW WORKSTATION

In Evidence Processing C148: Provide and install one (1) portable ductless fume hood with electronic low airflow monitoring and alarm. White epoxy coated steel frame and head unit with blue trim, perforated stainless steel worksurface with polypropylene spill tray underneath, electronic control panel, and as follows:

Manufacturer:	Air Science (800-306-0677)
Product:	Ductless Downflow Workstations (DWS)
Web Site:	www.airscience.com/56
Model No.:	DWS48
Internal Ht.:	15.75 inches (400 mm)
External Size:	48"x22.75"x31.5" (1220X580X800 mm)
Weight:	185 lbs (84 kg)
Airflow:	435 CFM
Face Velocity:	80 FPM
Noise:	< 52 dBA (1 meter)
Lighting:	Compact fluorescent
Blower:	Centrifugal fan
Electrical:	120V, 60Hz
Monitoring:	Low airflow alarm
Pre-Filter:	Electrostatic, 1 lbs (0.45 kg), nominal
Main Filter:	HEPA/UPLA (powders and particulates)

LOT #2 - UTILITY TABLES

Location as indicated below. Provide and install four (4) utility tables of various sizes with epoxy resin tops.

Table frames, 4 1/2" high, formed into C-channel shape. Table frames and bottom shelf rails 11-gauge cold rolled steel tubing, welded using the inert gas process (resistance welded). Chemical resistant powder paint finish; color to be selected by Owner from manufacturer's standard colors.

Epoxy resin top chemical and abrasion resist one inch thick cast material of epoxy resins and inert products; cast flat, with a uniform non-glare black matte finish.

Manufacturer: Thermo Scientific Hamilton
 Product: Max Mobile Tables
 Web Site: www.hamiltonlab.com/fisherhamilton/products

Model: Mobile Tables
 Style: Four-Leg Adjustable-Height Table Frames
 - With Locking Casters
 - Leg height adjusts easily with minimal tools.

Height: Adjustable from 31" to 40-3/8"
 Materials: Sheet steel, cold-rolled furniture stock
 Minimum Loads: 300 lbs (four legged)

Worksurfaces: Epoxy Resin
 Thickness: 1 inch
 Color: Black
 Edges: Square

Drawers: Suspended Pencil Drawer; Steel drawer, sloped front with full-width drawer pull, nylon-tired ball-bearing rollers.
 Size: 23"W x 21"D x 2"H nominal

Table #1 - Property and Evidence Storage C151

Provide one (1) table thus:

Size: 54 x 72 inches
 Drawer: (2) Pencil Drawers (1 drawer each side)
 Shelf: Provide steel shelf below

Table #2 & #3 - Evidence Processing C148

Provide two (2) tables thus:

Size: 54x72 inches
 Drawer: (2) Pencil Drawers (1 drawer each side)

Table #4 - Evidence Processing C148

Provide one (1) table thus:

Size: 30x60 inches
 Drawer: (2) Pencil Drawers (1 drawer each side)
 Shelf: Provide steel shelf below

LOT #3 - FORENSICS CABINET

In Evidence Processing C148: Provide and install one (1) forensics cabinet per the attached specification section 01 0110 Summary of Work and as follows:

Cabinet to have three separate fuming chambers of various sizes to allow separate fuming processes concurrently. Each chamber shall be dampered, lockable with padlock hasp, and glazed. Chambers shall have v-strip sealed doors to minimize airflow during fuming process. Each compartment shall include a vapor-proof incandescent light and access to 110 volt AC receptacles with power cord pass through. Unit is pre-wired to central junction box located on top of cabinet.

Construction shall be 45 pound density particle board core with doweled joinery. Wilsonart Chemsurf chemical resistant plastic laminate interior and high-pressure plastic laminate exterior.

Each unit shall contain a test report verifying proper containment with the chamber closed. Test shall be based on ASHRAE 110-1995 methodology. Containment must be 4.0 AM 0.05 PPM or better. Vent outlet extends 3 1/2" above top of cabinet at rear.

Hanging rods are provided in each chamber and shelves are provided in the large chamber, and as follows:

Manufacturer: Thermo Scientific Hamilton
 Product: Forensics Cabinet
 Web Site: www.hamiltonlab.com/fisherhamilton/products

Model: Floor Mounted Unit
 Model No.: 950P201GY
 Capacity: 31 Cubic Feet
 Exhaust Vol.: 31 CFM
 Exhaust Collar
 Diameter: 2 inches I.D.
 Weight: 395 lbs

Int HPL Color: D354 White
 Ext HPL Color: 1500N Gray

LOT #4 - FUME HOOD

In Evidence Processing C148: Provide and install one (1) ducted bench fume hood, worksurface and base cabinets per the attached specification section 01 0110 Summary of Work and section 11 6100 Laboratory Fume Hoods. Location indicated on attached floor plan drawing.

Manufacturer: Thermo Scientific Hamilton
Product: SafeAire II Fume Hood
Web Site: www.hamiltonlab.com/fisherhamilton/products

LOT #5 - DRYING CABINETS

In Evidence Garage B106: Provide and install one (1) each ductless forensic evidence downflow drying cabinets with single dynamic filtration chamber, electronic control panel, exterior hose connection to connect to external water supply, OSHA labeled waste water container in locking compartment, and inter-filter test port. White epoxy coated steel frame with blue metal framed tempered glass door, removable stainless steel hanging rod with anti-slide cover, (2) polypropylene shelves with drain channels, security key to filter access door, non-marking heavy-duty caster wheels, and as follows:

Manufacturer: Air Science (800-306-0677)
Product: Safekeeper Downflow Forensic Evidence Drying Cabinets (FDC)
Web Site: www.airscience.com/70

Drying Cabinet #1:

Model No.: FDC-006GL
Nominal Width: 36 inches (914 mm)
External Size: 36"x27.75"x73" (914x705x1854 mm)
Weight: 229 lbs (104 kg)

Drying Cabinet #2:

Model No.: FDC-007GL
Nominal Width: 48 inches (1219 mm)
External Size: 48"x27.75"x73" (1219x705x1854 mm)
Weight: 403 lbs (183 kg)

Controller: Microprocessor controller
(Air Science Monitair® Controller)
Face Velocity: 120-180 FPM
Blower: High-velocity centrifugal fan (sparkless and brushless)
Monitoring: Low airflow alarm (audio and visual)

Lighting: Internal fluorescent lamp in vapor proof housing

Electrical: 110V, 60Hz single phase

Pre-Filters: Electrostatic door and pre-evidence filters

Main Filter: Electrostatic, HEPA/ULPA and activated carbon (post-evidence)
(Air Science Multi-plex™ Filtration System)

**SECTION 01 0110
SUMMARY OF WORK**

PART 1 – GENERAL

1.01 SCOPE OF WORK OF THE LABORATORY EQUIPMENT CONTRACTOR

- A. Furnish laboratory casework and equipment. Furnish to building and un-pad and/or uncrate all specified casework and equipment.
 - 1. Equipment manufacturer shall be fully responsible for shipping and shall bear shipping expense, retain title during transit, and file damage claims as necessary.

- B. Installation: Set equipment in place, level, and scribe to walls as necessary. Completely install, erect and connect all fixtures, equipment and accessories ready for use. Work shall include:
 - 1. Scribes and filler panels.
 - 2. Service line piping, conduit and accessories necessary to properly connect fixtures, fittings, sinks and electrical outlets to building service outlets.
 - 3. Plumbing fixtures, sink plugs, traps and drain lines above floors, all installed, set and fully connected to building service outlets per equipment manufacturer's roughing-in drawings.
 - 4. Connection of fume hoods to ducts based on ducts being roughed-in within two inches of hood outlets and properly aligned.
 - 5. Pipe supports where specified.

- C. Clean up: Remove debris, dirt and rubbish accumulated as a result of delivery of this equipment and leave premises broom clean and orderly.

1.02 RELATED WORK BY OTHERS

- A. Framing and blocking of walls, floors and ceilings as required to adequately support equipment, and all plaster grounds and bucks required for proper installation of equipment.

- B. Building services to outlets and shutoff valves for connection of electrical and plumbing services to locations per equipment manufacturer's roughing-in drawings.

- C. Fume hood blower and properly installed transitions from fume hood outlet to ductwork to blower to atmosphere. Installation of exhaust ducts and interior repair of walls after ducts are installed.

- D. Building modifications and adjustment required to accomplish the work of the equipment contractor, including any cutting and patching required to accommodate equipment and services.

- E. Miscellaneous materials: Furnishings of miscellaneous materials generally classified as maintenance or supply items.
- F. Security during and after equipment installation: Protection provided by general contractor.

1.03 SUBMITTAL REQUIREMENTS

- A. Furnish one (1) set each of computer-generated electronic format (PDF) shop drawings and installation materials and/or drawings for Contractor's, Owner's and Architect's use as required.
- B. Submit the number and type of samples indicated in individual specification sections, one (1) of which will be retained by Architect.

1.04 INSPECTION AT FACTORY

- A. Owner has right to inspect equipment at contractor's plant prior to shipment. Equipment found not to be in conformance with requirements of the contract documents may be rejected.

1.05 DEFINITIONS

- A. Service Fixtures
 - 1. Plumbing service fixtures: Oxygen, gas, air, vacuum and steam cocks; ball turrets; hot, cold and distilled water faucets; remote control valves, flask-washers, steam mixing valves; filter pumps; vacuum breakers; eye washers; shower heads; steam cones and steam baths; sinks, cupsinks, traps, plaster traps.
 - 2. Electrical service fixtures: Electrical convenience outlet boxes, electrical pedestals, "C" type conduits, single or duplex A.C. or D.C. receptacles, switches, variable voltage units and fluorescent tubes.
- B. Service Lines
 - 1. Plumbing service lines: Oxygen, gas, air, vacuum, steam, hot and cold and distilled water piping; fittings; and shutoff valves necessary to carry respective services from the plumbing service fixtures through equipment to building roughing-in outlets in floors or walls.
 - 2. Electrical service lines: Conduit, junction boxes, conduit fittings and wire necessary to carry electrical services from the electrical service fixtures through equipment to building roughing-in outlets in floors or walls.
- C. Others
 - 1. Separate and independent contractors having no connection whatsoever with the Laboratory Furniture and Equipment Contractor, whether or not both are subcontractors to a common General Contractor. Plumbing, Heating and Ventilating, and Electrical Contractors and other subcontractors and mechanics required to complete "Work by Others" are not to be reimbursed by the Laboratory Furniture and Equipment Contractor.

- D. Glossary of Terms
1. **Drain Line:** Pipe or tubing connecting the sink outlet or trap to the building waste line.
 2. **Filler Panel:** Panel used to close an open area between unit and wall or between two units.
 3. **Furnish:** Supply to other contractors or subcontractors – not installed by Laboratory Furniture and Equipment Contractor.
 4. **Knee Space Panel:** Panel used to close the area under an apron, to enclose the plumbing space, or to shield the knee space area.
 5. **Pipe Support:** Rack or framework supporting service lines and located in the service tunnel.
 6. **Reagent Rack:** Unit of shelves for storage of reagent bottles, located at the back of wall tables and down the middle of center tables, with provisions for support of service lines and fittings serving the table provided in the supporting mechanisms of the reagent rack.
 7. **Scribe:** Strip of material scribed to the wall and fastened to the casework, to form a tight enclosure where the casework abuts the wall.
 8. **Service Line:** Pipe or tubing used to convey the gas or liquid service from the building service line to the plumbing fitting on the laboratory equipment.
 9. **Service Tunnel:** Area provided for service lines in the back of, or between, base cabinets, and under the work surface.
 10. **Service Turret:** Enclosure projecting above the table top to provide room for the service line to be brought up through the table top or for connection of the service line to fittings mounted on the outside surface of the turret enclosure.
 11. **Silencers:** Vibration isolator pads used under the blowers to prevent the noise that would be generated due to the blower vibration.
 12. **Sink Outlet:** Flanged fitting recessed and sealed into the sink bottom to provide means of connecting sink to drainage system.
 13. **Tank Nipple:** Short piece of pipe with a tapered thread on one end and a tapered thread connecting to a running thread on the other, used to anchor the plumbing fitting to the table top, and to connect it to the service lines.

1.06 WARRANTY

- A. Provide manufacturer's standard one-year warranty against defects in materials and workmanship.
- B. Subject to provisions of the warranty, manufacturer agrees to repair or replace non-conforming products or its parts or to refund the purchase price, at the manufacturer's option, for the warranty period following Substantial Completion.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

**SECTION 11 6100
LABORATORY FUME HOODS**

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Laboratory fume hood.
 - 2. Work surface with under-mount sink.
 - 3. Steel base cabinets.

1.02 GENERAL DESIGN REQUIREMENTS

- A. Fume hoods shall function as ventilated, enclosed workspaces, designed to capture, confine and exhaust fumes, vapors and particulate matter produced or generated within the enclosure.
- B. Design fume hoods for consistent and safe air flow through the hood face. Negative variations of face velocity shall not exceed 20% of the average face velocity at any designated measuring point as defined in this section.
- C. Average illumination of work area: Minimum 80 footcandles. Work area shall be defined as the area inside the superstructure from side to side and from face of baffle to the inside face of the sash, and from the working surface to a height of 28 inches.
- D. Fume hood shall be designed to minimize static pressure loss with adequate slot area and bell shaped exhaust collar configuration. Maximum average static pressure loss readings taken three diameters above the hood outlet from four points, 90 degrees apart, shall not exceed the following maximums with sash in full open position:

<u>Face Velocity</u>	<u>Measured S.P.L. (W.G.)</u>
75 F.P.M.	.18 inches
100 F.P.M.	.30 inches
125 F.P.M.	.45 inches
150 F.P.M.	.60 inches

- E. Fume hood shall maintain essentially constant exhaust volume at any baffle position for safety. Maximum variation in exhaust CFM, static pressure and average face velocity as a result of baffle adjustment shall not exceed 5% for any baffle position at the specified face velocity.
- F. Fume hoods shall be field convertible, from bypass type to auxiliary air by simple component replacement or addition. Change-over shall be accomplished without construction modifications and without special tools.

- G. Noise Criteria: Test data of octave band analysis verifying hood is capable of a 50 NC value when connected to a 50 NC HVAC source. Reading taken 3' in front of open sash at 100 fpm face velocity.

1.03 LINER SURFACE FINISH PERFORMANCE REQUIREMENTS

A. Test procedure:

1. Test No. 1 - Spills and Splashes:
 - a. Suspend in a vertical plane a 42" (horizontal) by 12" (vertical) panel divided into 3/4" wide vertical columns, each column numbered 1 through 49.
 - b. Apply five drops of each reagent listed with an eye dropper.
 - c. Apply liquid reagents at top of panel and allow to flow down full panel height.
(CAUTION! Flush away any reagent drops.)
2. Test No. 2 - Fumes and Gases:
 - a. Divide 24" x 12" panel into 2" squares, each square numbered 1 through 49.
 - b. Place 25 milliliters of reagent into 100 milliliter beakers and position panel over beaker tops in the proper sequence. Note: Beaker pouring lip permits atmospheric oxygen to enter and participate in the reaction of the reagent fumes.
3. After 24 hours remove panel, flush with water, clean with naphtha and detergent, rinse, wipe dry and evaluate.

B. Evaluation ratings: Change in surface finish and function shall be described by the following ratings:

1. No Effect: No detectable change in surface material.
2. Excellent: Slight detectable change in color or gloss, but no change to the function or life of the work surface material.
3. Good: Clearly discernible change in color or gloss, but no significant impairment of work surface function or life.
4. Fair: Objectionable change in appearance due to surface discoloration or etch, possibly resulting in deterioration of function over an extended period.
5. Failure: Pitting, cratering or erosion of work surface material; obvious and significant deterioration.

C. Test Results: "P" Fume Hood Liner (Poly-resin)

	<u>REAGENT LIST</u> <u>Concentrations by Weight</u>	<u>Test No. 1</u> <u>Rating Spills</u>	<u>Test No. 2</u> <u>Fumes</u>
1.	Sodium Hydroxide Flake	---	No Effect
2.	Sodium Hydroxide, 40%	Excellent	No Effect
3.	Sodium Hydroxide, 20%	Excellent	No Effect
4.	Sodium Hydroxide, 10%	Excellent	No Effect
5.	Ammonium Hydroxide, 28%	No Effect	No Effect
6.	Eldorado - Plus (Solution)	No Effect	No Effect
7.	Chloroform	Excellent	No Effect
8.	LpH SE (Solution)	No Effect	No Effect

LABORATORY FUME HOODS

9.	Trichloroethylene	Excellent	No Effect
10.	Monochlorobenzene	Excellent	No Effect

	<u>REAGENT LIST</u> <u>Concentrations by Weight</u>	<u>Test No. 1</u> <u>Rating Spills</u>	<u>Test No. 2</u> <u>Fumes</u>
11.	Tincture of Iodine	Excellent	Excellent
12.	Methyl Alcohol	No Effect	No Effect
13.	Ethyl Alcohol	No Effect	No Effect
14.	Butyl Alcohol	No Effect	No Effect
15.	Phenol, 85%	Excellent	No Effect
16.	Cresol	Excellent	No Effect
17.	Sodium Sulfide, Saturated	Good	No Effect
18.	Furfural	Fair	No Effect
19.	Dioxane	No Effect	No Effect
20.	Zinc Chloride, Saturated	No Effect	No Effect
21.	Benzene	Excellent	No Effect
22.	Toluene	Excellent	No Effect
23.	Xylene	Excellent	No Effect
24.	Gasoline	Excellent	No Effect
25.	Naphthalene	Excellent	No Effect
26.	Methyl Ethyl Ketone	Excellent	No Effect
27.	Acetone	Excellent	No Effect
28.	Ethyl Acetate	Excellent	No Effect
29.	Amyl Acetate	Excellent	No Effect
30.	Ethyl Ether	Excellent	No Effect
31.	Silver Nitrate, 10%	Good	No Effect
32.	Di Methyl Formamide	No Effect	Excellent
33.	Formaldehyde, 37%	No Effect	No Effect
34.	Formic Acid, 88%	No Effect	No Effect
35.	Acetic Acid, Glacial	No Effect	No Effect
36.	Dichloro Acetic Acid, 93%	Excellent	Excellent
37.	Chromic Acid, Saturated	Good	No Effect
38.	Phosphoric Acid, 85%	No Effect	No Effect
39.	Sulfuric Acid, 33%	No Effect	No Effect
40.	Sulfuric Acid, 77%	Excellent	No Effect
41.	Sulfuric Acid, 93%	Good	No Effect
42.	Hydrogen Peroxide, 30%	No Effect	No Effect
43.	Acid Dichromate	Excellent	No Effect
44.	Nitric Acid, 20%	Excellent	No Effect
45.	Nitric Acid, 30%	Excellent	No Effect
46.	40 & 47 Equal Parts	Excellent	Good
47.	Nitric Acid, 70%	Excellent	Good
48.	Hydrochloric Acid, 37%	No Effect	Excellent
49.	Hydrofluoric Acid, 48%	No Effect	Failure

1.04 SUBMITTALS

- A. Shop Drawings: Indicate equipment locations, large scale plans, elevations, cross sections, rough-in and anchor placement dimensions and tolerances and all required clearances.

- B. Product Data: Submit manufacturer's data for each component and item of laboratory equipment specified. Include component dimensions, configurations, construction details, joint details, and attachments, utility and service requirements and locations.
- C. Samples: Submit two (2) 3 x 6 inch samples of finish for fume hood and accessories for selection by Owner.
- D. Test Reports: Submit test reports on each size and type of hood verifying conformance to test performances specified. Test report must accompany each hood as part of installation and usage package. Submit independent test reports as required by specification.
- E. Instructions: Submit for review and approval
 - 1. Instructions to be inscribed on instruction plate to be attached to hood, as specified in Part 2 of this Section.
 - 2. Written instructions in booklet form providing additional details on safe and proper operation and maintenance.

1.05 QUALITY ASSURANCE

- A. Manufacturer's qualifications: Modern plant with proper tools, dies, fixtures and skilled workmen to produce high quality laboratory casework and equipment, and shall meet the following minimum requirements:
 - 1. Five years or more experience in manufacture of laboratory casework and equipment of type specified.
 - 2. Ten installations of equal or larger size and requirements.
 - 3. UL 1805 Specification:
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.
- B. Installer's qualifications: Factory certified by the manufacturer.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Schedule delivery of equipment so that spaces are sufficiently complete that equipment can be installed immediately following delivery.
- B. Protect finished surfaces from soiling or damage during handling and installation. Keep covered with polyethylene film or other protective coating.

1.07 PROJECT CONDITIONS

- A. Do not deliver or install equipment until the following conditions have been met:
 1. Windows and doors are installed and the building is secure and weather tight.
 2. Ceiling, overhead ductwork and lighting are installed.
 3. All painting is completed and floor tile located below casework is installed.

PART 2 – PRODUCTS

2.01 MANUFACTURER

- A. Equipment manufacturer: Fisher Hamilton L.L.C., 1316-18th Street, Two Rivers, Wisconsin 54241.
- B. Product: SafeAire II Fume Hood, Constant Volume Bypass Superstructure.
- C. Product: Epoxy Resin Dished Work Surface.
- D. Product: Steel Base Cabinets.

2.02 FUME HOOD MATERIALS

- A. Steel: High quality, cold rolled, mild steel meeting requirements of ASTM A366; 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. Bypass grilles: Low resistant type, 18 gauge steel, upward directional louvers.
- E. Safety glass: 7/32" thick laminated safety glass.
- F. Sash cables: Stainless steel, uncoated, 1/8" diameter military spec. quality. (MIL-W-83420D-3)
- G. Sash guides: Corrosion resistant poly-vinyl chloride.
- H. Pulley assembly for sash cable: 2" diameter, zinc dichromate finish, ball bearing type, with cable retaining device. (Nylon tired-not acceptable.)
- I. Sash pull: Full width corrosion resistant plastic, stainless steel or steel with chemical resistant powder coating.
- J. Gaskets: 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" not acceptable.)
 3. Exterior panel member fastening devices to be corrosion resistant, non-metallic material. Exposed screws not acceptable.
- L. Instruction plate: Corrosion resistant or plastic plate attached to the fume hood exterior with condensed information covering recommended locations for apparatus and 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 and a corrosion resistant inner liner, and 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 bracketry from hood interior.
 2. 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.
- B. Exhaust outlet: Rectangular with ends radiused, shaped and flanged, 18 gauge steel finished with Chameleon powder coating.
- C. Access opening perimeter: Air foil 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 and relatively flush with the top of the work surface. Bottom foil shall be removable without use of special tools. Bottom foil shall provide access areas for electrical cords. Bottom foil: Steel with urethane powder coating I to increase acid and abrasion resistance.
- D. Fume hood sash: Full view type with clear, unobstructed, side-to-side view of fume hood interior and service fixture connections.
1. Bottom sash rail: 2" maximum, 18 gauge steel with urethane powder coat finish. Provide integral formed, flush pull the full width of bottom rail.
 2. Set safety glass into rails in deep form, extruded poly-vinyl chloride glazing channels.
 3. Counter balance system: Single weight, pulley, cable, counter balance system which prevents sash tilting and permits one finger operation at any point along full width pull. Maximum 7 pounds pull required to raise or lower sash throughout its full length of travel. Design system to hold sash at any position without creep and to prevent sash drop in the event of cable failure. Life cycle test 100 pound sash and weight to 100,000 cycles without sign of failure. Provide independent test data.
 4. Postless sash design: Per drawing details.
 5. Open and close sash against rubber bumper stops.

- E. Fume hood liner: Poly-resin (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: 25 or less per U.L. 723 and ASTM E84-80.
- F. Baffles: Baffles providing controlled air vectors into and through the fume hood must be fabricated of the same material as the liner. Provide exhaust slots full height on vertical sides of the baffle with upper slots adjustable. All baffle supports/brackets to be non-metallic.
- G. Multi-position fixed baffle: Slotted non-metallic baffle supports allow upper baffle panel to be repositioned prior to hood operation permitting setting for (1) high thermal loading and (2) normal or average operation.
1. Provide acid resistant label indicating proper baffle operation. Locate label on sidewall of hood interior next to slotted baffle support.
 2. Baffle designs which permit close-off of all slots are not acceptable.
 3. Must comply with OSHA Lab Standard Guidelines. (Easily reached/adjusted with only arm in hood.)
 4. Non-adjustable baffles and baffles that require the use of tools for adjustment or repositioning are unacceptable.
 5. Baffle designs with metallic supports or fasteners not acceptable.
- H. Service fixtures and fittings:
1. Service treatment: Fittings are to be coated with a chemically resistant polyester powder lacquer electrostatically applied and backed on for a uniform finish.
 2. Handle and outlet nozzle will be color coded to the media, with the same polyester powder lacquer finish. Handles shall be metal with media identification text. 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:
 - a. Where local plumbing code requires a vacuum breaker, a vacuum breaker shall be provided by the equipment supplier. Exposed vacuum breakers and exposed interconnecting piping shall be chrome plated.
 - b. Sink traps shall be accessible and include a cleanout at the bottom of the trap.
 4. Fixture fittings 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. Brass with chemically resistant polyester powder lacquer color coded to the media.
 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

- 8. All outlets shall have detachable serrated nozzles.
- 9. All valves shall be front-loaded for ease of access and maintenance at point of use.

- I. Hood light fixture: Two lamp/T8, 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 six feet. Provide two 36" fixtures for hoods with eight foot superstructures.
 - 3. Include lamps with fixtures.
 - 4. Illumination: Per performance values, Part 1 of this Section.

- K. Electrical services: Three wire grounding type receptacles rated at 120 V.A.C. at 20 amperes. Flush plates: Black acid resistant thermoplastic.

2.04 BYPASS TYPE FUME HOODS

- A. Constant volume type 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 impedance, directionally louvered panel provided in the lintel bypass area and one inch bypass provided immediately above the work surface and directly below the bottom horizontal sash rail. Designs which require all bypass to enter hood over front solid panel - not acceptable.
- D. As sash is lowered, bypass design shall limit the increase in face velocity to maximum of four times the average face velocity with the sash full open.
- E. Sash: Standard.
- F. Width: 60 inches.
- G. Depth: 30 inches.

2.05 METAL FINISH

- A. Preparation: Spray clean metal with a heated cleaner/phosphate solution, pretreat with iron phosphate spray, water rinse, and neutral final seal. Immediately dry in heated ovens, gradually cooled, prior to application of finish.
- B. Application: Electrostatically apply urethane powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a chemical resistant, high grade laboratory furniture quality finish of the following thicknesses:

1. Exterior and interior surfaces exposed to view: 1.5 mil average and 1.2 mil minimum.
2. Backs of cabinets and other surfaces not exposed to view: 1.0 mil average.

2.06 SOURCE QUALITY CONTROL TESTING OF FUME HOODS

- A. Evaluation of manufacturer's standard product shall take place in manufacturer's approved test facility, with testing personnel, samples, apparatus, instruments, and test materials supplied by the manufacturer at no cost to the Owner.
- B. Submit test report consisting of the following test parameters and equipment for each hood width and configuration specified.
- C. Hood shall achieve a rating of 4.0 AM 0.1 P.P.M. or better. Tested to ASHRAE-110-R.
- D. Test facility: Sufficient size to provide unobstructed clearance of five feet each side and ten feet in front of fume hood. Provide make-up air to replace room air exhausted through fume hood and to obtain a negative 0.2" w.g. room pressure. Introduce make-up air in a manner that minimizes drafts in front of hood to less than 20% of the face velocity. Connect 100 feet per minute air velocity through face of fume hood. Adjustment in blower shall vary face velocity down to 75 feet per minute.
 1. Examine facility to verify conformance to the requirements of this Section.
 2. Test room shall be isolated from all personnel during test procedure.
- E. Testing equipment:
 1. Properly calibrated hot wire thermal anemometer probes equal to Sierra Model 600-02; correlate with computer data acquisition format to provide simultaneous readings at all points.
 2. Pitot tube and inclined manometer with graduations no greater than 0.2 inch of water, equal to F.W. Dwyer Model 400. Calibration curves based on 20. Pitot traverse readings and correlated to a digital readout indicator to provide quick and accurate adjustment of air flows.
 3. Tracer gas: Sulfur hexa-fluoride supplied from a cylinder at a test flow rate of four liters per minute.
 4. Ejector system: Tracer gas ejector equal to IHE No. 525-014. Submit sufficient proof of ejector system calibration.
 5. Critical orifice: Sized to provide tracer gas at four liters per minute at an upstream pressure of 30 PSIG.
 6. Detection instruments: Ion Track Model 61 Leak Meter II sulfur hexafluoride detector instrument.
 7. Recorder with an accuracy better than plus or minus 0.5% of full scale.
 8. Three dimensional manikin, overall height 67", clothed in a smock.
 9. Titanium tetrachloride glass modules. CAUTION: Titanium tetrachloride is corrosive and irritating; skin contact or inhalation shall be avoided.
 10. One dozen 30-second smoke bombs.

- F. Preliminary Test and Data:
1. Provide sketch of room indicating room layout, location of significant equipment, including test hood and other hoods. Provide sketch of air supply system indicating type of supply fixtures.
 2. Reverse air flows and dead space:
 - a. Swab strip of titanium tetrachloride along both walls and floor of hood in a line 6" behind and parallel to the hood face, and along the top of the face opening. Swab an 8" diameter circle on the back of the hood. All smoke should be carried to the back of the hood and exhausted.
 - b. Test the operation of the bottom air bypass air foil by running the cotton swab under the air foil.
 - c. If visible fumes flow out of the front of the hood, the hood fails the test and receives no rating.
 3. Face velocity measurements: Face velocity shall be determined by averaging minimum of four and maximum of eight readings at the hood face. Take readings at center of a grid made up of sections of equal area across the top half of the face and sections of equal area across the bottom half of the face. Take simultaneous readings at each point with a series of calibrated hot wire anemometers over a one minute period of time. Probes shall be correlated to a computer data acquisition package, which will provide an average of each reading over that one minute period and also an overall average. During the one minute monitoring period, all velocities must automatically update average at a maximum of four second intervals.
- G. Test Procedure:
1. 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. Position sash in the full open position.
 2. Measure exhaust air flow with the baffles' position to give maximum air flow. Measure exhaust air volume with baffles' position to give minimum air flow. Verify that the air volume at minimum air flow is not less than 95% of the exhaust air volume at maximum air flow. Hoods exceeding this fail the test and receive no rating.
 3. Take a static pressure reading, using methods assuring an accurate reading, in an area of the ductwork no more than three feet nor less than one foot above the exhaust collar. Static pressure loss shall not exceed values given under Design Requirements in Part 1 of this Section.
 4. Install ejector in test positions. 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 center line is 12" from the left inside wall of the hood; center position is equal distance from the inside sidewalls; and the right position is 12" from the right inside wall. The ejector body is 6" in from the hood face in all positions. Location of ejector may require modification for hoods of unusual dimensions.
 5. Install manikin positioned in front of the hood, centered on the ejector.

6. Fix detector probe in the region of the nose and mouth of the manikin. Take care that method of attachment of the probe does not interfere with the flow patterns around the manikin. Locate nose of manikin 9" in front of ejector (3" in front of sash).
7. Open tracer gas block valve. Correlate readings with a computer data acquisition package, which is capable of monitoring and visually recording a minimum of one reading per second for a minimal three minute time period at each of the three positions.
8. The control level rating of the hood shall be the maximum of the three average values for the three test positions.
9. Record performance rating of the fume hood as XXAMyyy, where XX equals the release rate in liters per minute (4.0) and AM represents the as manufactured test sequence and yyy equals the control level in parts per million.
10. All data on the above test conditions including instrumentation and equipment, test conditions, preliminary test and data information shall be provided on a one page report, including a printout of the average face velocities, and a separate graph-type performance curve on all three tracer gas positions.

H. Constant Volume/Bypass and VAV/Conventional Fume Hoods:

1. Conduct test as outlined above with the sash open.
2. Ignite a smoke bomb within the fume hood work area to verify that the fumes are quickly and efficiently carried away. Move the lighted bomb about the fume hood work area, checking near fume hood ends and work surface to verify that there is no reverse flow of air at these locations.

I. Air flow in fume hoods with auxiliary air:

1. When the specified velocity has been determined, the volume of exhaust air should be verified by multiplying the average face velocity by the square foot area of the fume hood opening. The volume of exhaust air may be determined by other recognized procedures. In accordance with industry standards, the auxiliary air blower shall be turned off during face velocity grid readings.
2. Following grid readings, turn on the auxiliary air blower, adjust to give the proper quantity of auxiliary air, and continue with other steps outlined in Test Procedures above. The quantity of auxiliary air should be determined by the use of a 20 point Pitot tube traverse of the duct and be correlated to an indicator to provide easy adjustment for varying volumes. The quantity of auxiliary air may be determined by other recognized procedures. The temperature of the auxiliary air shall be adjusted to 10 degrees F. above the room temperature.
3. When the proper air volumes and temperatures have been obtained and with the sash in the full open position except as indicated, conduct the following tests:
 - a. Ignite a smoke bomb within the fume hood work area to verify that the fumes are quickly and efficiently carried away. Move the lighted bomb about the fume hood work area, checking near fume hood ends and work surface to verify that there is no reverse flow of air at these locations.

- b. Discharge smoke bomb into the auxiliary air duct ahead of the blower to insure that the smoke is thoroughly mixed with the auxiliary air. Observe the flow of air down and into the fume hood face to verify that capture efficiency is 95% minimum.
- 4. With the sash in a closed position, discharge a smoke bomb in auxiliary air duct and verify that all smoke and air is captured and drawn through the fume hood work area.

2.07 BASE CABINET

- A. Base Cabinet: Steel base cabinet, solid hinged doors, shelf adjustable in 1/2" increments, flush panel above cupboard.
 - 1. Size: 30"W x 35"H x 30"D.
 - 2. Finished to match fume hood superstructure.
- B. Sink Base Cabinet: Steel base cabinet, solid hinged doors, flush panel above cupboard with removable back panel (or open).
 - 1. Size: 30"W x 35"H x 30"D.
 - 2. Finished to match fume hood superstructure.
- C. Work Surface: Molded epoxy resin 1-1/4" thick surface, dished a nominal one-half inch to contain spills, with rear sink cutout.
 - 1. Finish: Black, low sheen.
 - 2. Size: 60"W x 30"D.
- D. Sink: 12x12x8 inch molded epoxy resin sink, under-counter mount with hot/cold mix faucet and polyolefin trap. Locate sink in left side of fume hood cabinet.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify dimensions and blocking tolerances are acceptable and that walls, ceilings and casework are ready to accept installation of fume hood.
- B. Verify type and location of electrical, mechanical and other utilities connections, as applicable.

3.02 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.

3.03 FIELD QUALITY CONTROL TESTING OF FUME HOODS

- A. Field testing requirements:
 - 1. Perform tests in field to verify proper operation of the fume hoods before they are put in use, using only qualified personnel.
 - 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 – SEFA-1 2006:
 - 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.
 - a. If not in accordance with specifications, refer to manufacturer's Troubleshooting Guide for aid in determining cause of variation in air flow.
 - 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 air flow in fume hoods without auxiliary air:
1. Turn fume hood exhaust blower on. With sash in the open position check air flow into the fume hood using a cotton swab dipped in titanium tetrachloride or other smoke source. Verify that air flow 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 side walls and baffle. Verify that smoke is contained within the fume hood and rapidly exhausted.
- E. Field testing of air flow in fume hoods with auxiliary air:
1. 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 2006.
 2. With sash in the open position check air flow into the fume hood using a cotton swab dipped in titanium tetrachloride or other smoke source. Verify that air flow 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.
 3. 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.
 4. Move a lighted smoke bomb throughout the fume hood work area directing smoke across the work surface and against the side walls and baffle. Verify that smoke is contained within the fume hood and rapidly exhausted.

3.04 ADJUSTING

- A. Repair or remove and replace defective work, as directed by Owner upon completion of installation.
- B. Adjust sash, fixtures, accessories and other moving or operating parts to function smoothly.

3.05 CLEANING

- A. Clean equipment, touch up as required.

3.06 PROTECTION OF FINISHED WORK

- A. Provide all necessary protective measures to prevent exposure of equipment from exposure to other construction activity.
- B. Advise contractor of procedures and precautions for protection of material and installed fume hoods from damage by work of other trades.

END OF SECTION