

SECTION 11 53 13 - CHEMICAL FUME HOODS

PART I - GENERAL

1.1 SECTION INCLUDES

- A. Chemical Fume Hoods, Benchtop Type
 - 1. Constant Volume
 - 2. Variable Air Volume (VAV)
 - 3. High Performance
 - 4. Radioisotope
 - 5. Perchloric Acid
- B. Service Fittings
- C. Base Cabinets
 - 1. General Storage
 - 2. Acid/Base Storage
 - 3. Solvent Storage

1.2 RELATED SECTIONS

- A. *General Guidelines - Laboratory Ventilation*
- B. *Section 23 34 00 – HVAC Fans*
- C. *Section 23 231 00 – HVAC Ducts*

1.3 REFERENCES

- A. Chemical Fume Hoods
 - 1. *ANSI/AIHA Z9.5 – Laboratory Ventilation*
 - 2. *NFPA 45 – Standard on Fire Protection for Laboratories Using Chemicals*
 - 3. *OSHA 29CFR 1910.1450 – Occupational Exposure to Hazardous Chemicals in Laboratories*
 - 4. *SEFA 1 - Scientific Equipment and Furniture Association, Recommended Practices for Laboratory Fume Hoods*
 - 5. *SEFA 8 – Recommended Practices for Laboratory Grade Metal Casework*
 - 6. *ASTM E84-09C, ANSI 2.5, NFPA 255*
 - 7. *ANSI/ASHRAE Standard 110 – Method of Testing Performance of Laboratory Fume Hoods*
 - 8. *ASHRAE Standard 62.1 – Ventilation for Acceptable Indoor Air Quality*
 - 9. *Task Sheet 1C, Laboratory Airflow Distribution - Rowan, Williams, Davies & Irwin, Inc. (RWDI) and Exposure Control Technologies, Inc. (ECT, Inc.)*
- B. Service Fittings
 - 1. *Scientific Apparatus Makers Association Standard for Laboratory and Hospital Service Fittings*
- C. Base Cabinets

1. *NFPA 30 – Flammable and Combustible Liquids Code*
2. *Factory Mutual Approval Standard 6050*

1.4 QUALITY ASSURANCE

- A. Except where modified or exceeded by requirements of this specification, products and execution shall be in compliance with applicable codes and standards including those referenced above in paragraph entitled *REFERENCES*.
- B. Installation, start-up and operation shall be in compliance with Manufacturer's recommendations and IOM.

1.5 SUBMITTALS

- A. Manufacturer's Product Data
 1. Fume hood and base cabinet
 - a. Materials of construction for all components including coatings
 - b. Gauge/thickness of sheet, plate and structural members
 - c. Weight of installed unit
 - d. Construction details
 - b. Service fittings and faucets
 - c. Lighting and electrical
 - d. Accessories
- B. Dimensioned Drawings
 1. Fume hood and base cabinet including sectional views showing internal components and placement of service fittings, lighting, electrical and accessories
- C. Manufacturer performance data at given face velocities
 1. CFM
 2. Static pressure drop
- D. Installation, Operation and Instruction Manual (IOM)
- E. Shop Drawings
 1. Placement
 - a. Laboratory layout with placement and orientation of fume hood identified
 2. Rough-in
 - a. Location and requirements for utility and service connections
 3. Assembly
 - a. Details and dimensions for assembly and installation of chemical fume hoods, chemical storage cabinets and other items within laboratory
 5. Field Joints
 - a. Locations and fastener types for securing units in place
 - b. Location and details of field joints between units and tops
 - c. Location, size and details of filler panels as applicable.
 6. Duct Connection

G. Reports

1. *ASHRAE 110* test reports for “as installed” fume hoods
2. Room air balance report
3. Minimum airflow setpoint
4. Fume hood density calculations
 - a. Such shall show design area of laboratory compared to maximum and operating fume hood opening areas.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Fume hoods and associated components including service fittings shall be transported and stored prior to and during construction in manner that provides protection from weather, physical damage and contamination with dust, debris or fluids.

1.7 WARRANTY

- A. Fume hoods, base cabinets and associated components shall be warranted to be free from defects in material and workmanship and to perform as specified for period of one year from date placed into useful service or 18 months from date of delivery, whichever occurs first. Defective product shall be repaired or replaced at no cost to Owner.

1.8 CERTIFICATION REQUIREMENTS

Note: As applied to fume hoods, the term “*Certification*” does not represent formal approval by a recognized governing body. That is to say, certification as it applies to fume hoods is an informal descriptor. However, for the purposes of this specification the term *Certification* shall be defined as “*Compliance with requirements of applicable Codes and Standards as confirmed by ASHRAE 110 testing*”.

- A. Certification of designated fume hoods shall be based upon application of *ASHRAE Standard 110* test procedure.
 1. Testing and balancing shall be performed by *NEBB* certified technician(s) in the employ of a *SMACNA* member contractor/agency, including the University of Illinois.
 - a. TAB technician shall be formally trained to perform fume hood testing in conformance with *ASHRAE Standard 110*. Written evidence of successful completion of such training shall be provided.
 2. Final approval of testing and acceptance of certification shall be provided by *F&S Division of Safety and Compliance*.
- B. Certification shall be provided for following:
 1. Newly installed fume hoods
 2. Recommissioned fume hoods (i.e. hoods placed back into service after previously decommissioned)
 3. Fume hoods affected by alterations to exhaust system. Such alterations may include:
 - a. Duct modifications
 - b. Exhaust fan modifications
 - c. Addition or removal of hoods to/from system
 - d. Laboratory control system modifications

[Note to PSC: Clearly identify in project documents which hoods require certification.]

- C. Certification shall be based upon hood type and sash position as follows:

1. Standard performance fume hoods shall be certified with sash at operating position as identified in paragraph below entitled *Sash Position*.
2. High performance fume hoods shall be certified with sash at full open position.

D. Sash Position

1. Operating position

- a. For vertical sliding sash, operating position shall be 18" vertical opening.
- b. For horizontal sliding sash, operating position shall be single 18" opening between sashes.
- c. For combination sliding sashes:
 - 1) Operating position shall be 18" vertical opening with horizontal sashes closed.
 - 2) Operating position shall be single 18" horizontal opening with vertical sash assembly closed.
- d. Operating sash openings other than those identified above must receive approval of *Division of Research Safety and F&S Division of Safety and Compliance*.

[Note to PSC: If design will be based upon non-standard operating position obtain approval of referenced authorities and edit specifications accordingly. Clearly indicate any non-standard operating sash position in project documents.]

2. Full open position

- a. For vertical sliding sash, full open position, 25" minimum, typical 27-28",
- b. For horizontal and combination sliding sashes, full open position dependent upon hood width and design

E. Containment Testing

1. *ASHRAE Standard 110* testing shall be performed to confirm adequate containment within approved face velocity range for hood type. See section below entitled *Face Velocity*.
2. *ASHRAE 110* test shall use standard SF-6 gas release rate of 4 liters/minute. For high hazard applications a release rate of 8 liters/minute may be required to ensure adequate containment. Such determination shall be made by *Qualified Design Professional* in conjunction with *F&S Division of Safety and Compliance*.

[For reference: Release rate of 8 LPM approximates violently boiling water on a 500 watt hot plate. Release rate of 1 LPM approximates pouring volatile solvents back and forth from one beaker to another. Release rate of 4 LPM is intermediate rate used for testing.]
3. If hood fails to provide such containment within limits of referenced face velocity range, test shall be repeated. Face velocity shall be increased or decreased as appropriate by increments of no less than 5 fpm. Testing shall be repeated until successful result is achieved.
4. Once successful result has been achieved, corresponding face velocity shall be identified as lower or upper limit of range as applicable.
5. Certification for individual hood shall be based upon range of face velocities identified in such manner.
6. Hood shall not be operated at face velocity outside range identified in this manner or outside the manufacturer's recommended face velocity range.
7. For high hazard applications, allowable face velocity range shall be confirmed by *Division of Research Safety and F&S Division of Safety and Compliance*.

F. Face Velocity

Note: If limits identified below are outside manufacturer's recommended face velocity range, manufacturer's recommended range shall be applied.

1. Conventional Fume Hoods, Constant Volume and VAV
 - a. Face velocity shall be **no less than 80 fpm** and **no greater than 120 fpm**. No individual face velocity measurement shall exceed plus or minus 20% of average.
2. High Performance Chemical Fume Hoods, Constant Volume and VAV
 - a. Face velocity shall be **no less than 60 fpm** and **no greater than 120 fpm**. No individual face velocity measurement shall exceed plus or minus 10% of average
3. Radioisotope Fume Hoods, Constant Volume
 - a. Face velocity shall be **no less than 95 fpm** and **no greater than 110 fpm**. No individual face velocity measurement shall exceed plus or minus 20% of average.
4. Perchloric Acid Fume Hoods, Constant Volume
 - a. Face velocity shall be **no less than 95 fpm** and **no greater than 110 fpm**. No individual face velocity measurement shall exceed plus or minus 10% of average.

1.9 MINIMUM AIRFLOW REQUIREMENT

A. To ensure adequate containment and dilution, airflow rate through fume hood with sash in fully closed position shall be maintained at...

1. 375 ACH within hood. Typically 25 CFM/SF internal work surface.
2. Alternately, minimum airflow rate as determined by analysis.

[Note to PSC: For high hazard applications, Contact UIUC Division of Research Safety and Division of Safety and Compliance to determine necessity of and methodology for performing analysis. Information regarding chemicals and processes shall be provided by laboratory personnel. Information regarding hood performance shall be provided by hood manufacturer.]

PART 2 - PRODUCTS

2.1 CHEMICAL FUME HOODS

A. Approved Manufacturers

1. Labconco
2. Kewaunee
3. Motte

B. Description

1. Chemical fume hoods shall consist of vented containment enclosure designed to capture, contain and exhaust fumes generated within enclosure while protecting user from exposure within acceptable limits as demonstrated by certified testing.
2. Chemical fume hoods shall consist of exterior cabinet with supports, interior liner, work surface, movable sash, inner baffle, services and accessories.
3. Fume hoods specified herein shall have remote exhaust blowers provided by others.
4. Specifications provided herein shall apply to bench top hoods only. Specifications for walk-in (aka floor-mounted) hoods provided separately. *[Note to PSC: Provide separate specification for walk-in fume hoods or edit these to include such hoods.]*

C. Hood Types

1. Constant Volume
 - a. Hoods shall be open bypass type for constant volume laboratory ventilation systems.
 2. Variable Air Volume (VAV)
 - a. Hoods shall be restricted bypass type for variable air volume laboratory ventilation systems.
 - b. VAV lab systems shall include active face velocity controls.
 3. Special Purpose (e.g. radioisotope, perchloric acid)
 - a. Special purpose hoods required for non-standard applications.
 - b. Special purpose hoods/systems shall be individually designed.
 - c. Installation of special purpose hoods must receive approval of *F&S Division of Safety and Compliance*.
- D. Hood Size
1. Width, depth and height shall be as scheduled and/or shown on drawings.
 2. For vertical sash hoods, size shall accommodate vertical sash operating position of 18".
- E. Hood Components
1. Exterior Cabinet with Support Structure
 - a. Exterior panels shall be removable, assembled with mechanical fasteners.
 - b. Provision shall be made for access to captured internal components.
 - c. Color of panels shall be as selected by Architect.
 2. Front Corner Posts
 - a. Front double wall posts shall be pre-punched to receive plumbing fixtures, electric outlets, light switches and accessories.
 - b. Provision shall be made for access to captured components.
 3. Inner Liner
 - a. Liner shall be affixed to superstructure with concealed stainless steel fasteners.
 - c. Provision shall be made for access to captured internal components.
 - d. Punched holes shall be provided in each side wall to receive service fittings for use with remote controls.
 4. Airfoil
 - a. Airfoil shall be provided at sash sill.
 - b. Airfoil shall allow bypass flow when sash is in fully closed position.
 - c. Airfoil shall have aerodynamic radius to sweep air into the hood and across work surface with minimal turbulence.
 - d. Airfoil shall be removable for ease of cleaning.
 5. Work Surface
 - a. Unless integral to hood, work surface shall be dished to contain spilled fluid and contoured to conform to interior liner of hood.
 - b. Work surface shall incorporate openings required for plumbing fixtures, pass-through openings, cup sinks and base cabinet venting as applicable.

6. Bypass
 - a. For constant flow exhaust system, provision of open air bypass feature shall be incorporated into hood design.
 - b. Bypass opening with grille shall be located at top of sash opening.
 - c. Bypass shall have completely positive operation, not dependent upon mechanical or electrical linkage.
 - d. Bypass block (blank-off panel) shall be provided to offer significant restriction to bypass opening for VAV operation.
 - e. Restricted bypass shall be provided for VAV hoods
7. Sash System
 - a. Hood shall have single vertical sliding sash unless indicated otherwise in project documents.
 - b. Vertical sash shall include counterbalance system consisting of cable and pulley or chain and sprocket mechanism with single counterbalance weight.
 - c. Counterbalance system shall hold sash at any position without creep and shall prevent sash drop in event of cable or chain failure.
 - d. Defeatable automatically resetting sash stop shall be provided, preset at 18" sash height.
 - e. Sash tracks shall incorporate bump stops for opening and closing.
 - f. Sash handle shall incorporate perforated air passage to direct air away from user's breathing zone.
6. Baffle
 - a. Interior baffle system shall be provided.
 - b. Baffles shall be designed to optimize face velocity profile and capture wide range of gaseous densities without adjustment or moving components.
 - c. Horizontal slots with chamfered entry shall be located at work surface, central and upper areas within hood.
 - d. Baffles shall be removable for cleaning without use of tools.
 - e. Moving or adjustable baffles not acceptable.
 - f. Exposed components shall be non-metallic.
7. Duct Collar
 - a. Duct collar shall be provided at top of hood to facilitate convenient attachment of exhaust duct.
 - b. Collar shall be configured to facilitate condensate drainage into hood.
8. Electrical
 - a. Hood shall be prewired to single point junction box.
 - b. Hood shall be provided with one or more GFI 120V duplex convenience outlet(s) as indicated in project documents. Outlet(s) shall be located on front corner post and shall have stainless steel cover.
 - c. Hoods with potential exposure to flammable vapors shall have no electrical wiring, switches or receptacles within hood.

- d. All electrical shall be UL rated.
- 9. Lighting
 - a. Lighting shall be provided within hood, factory installed.
 - b. Lighting shall be LED with vapor proof cover installed outside hood liner protected from hood interior with transparent, impact resistant shield.
 - c. Standard toggle switch shall be located on front corner post.
 - d. Hoods with potential exposure to flammable vapors shall have Class 1, Division 1 explosion proof light fixtures.
- 10. Service Fittings
 - a. Service fittings shall be provided as indicated in project documents.
 - b. Service fittings shall typically be located near back of hood and shall in no case be located within 6" of hood face.
 - c. Remote handles shall be provided at front corner post of hood.
 - d. All service fittings, tubing, valves and handles shall be factory installed unless indicated otherwise by user.
 - e. See section below entitled *SERVICE FITTINGS* for additional requirements.
- 11. Cup Sinks
 - a. Cup sink(s) shall be provided and located as indicated in project documents.
- 12. Piping
 - a. Utility pipe connections shall be no less than ½" nominal size.
 - b. Gas piping shall be "hard-piped" with no flexible connections.
- 13. Sash Position Sensor
 - a. Sash position sensor shall be provided. Sensor shall be high quality potentiometer type firmly mounted, readily accessible.
 - b. Sash sensor shall be compatible with lab ventilation control system.
- 14. *[Note to PSC: Indicate which hoods are to receive sash position sensors for specific project. Delete requirement for sash position sensor if function will be provided by lab control system.]*
- 15. Airflow Monitor
 - a. Approved flow monitor with audible alarm shall be provided unless indicated otherwise. Monitor shall be provided on hoods as follows:
 - 1) Each new hood
 - 2) Each modified hood when modification affects airflow at hood or within laboratory.
 - b. Flow monitor type and design shall be coordinated with laboratory control system.

[Note to AE: Indicate which hoods are to receive monitors for specific project. Delete requirement for flow monitor if functions will be provided by lab control system.]
- 15. Filler Panels
 - a. Filler panels shall be provided as shown on drawings.

F. Materials of Construction

1. Flame Spread
 - a. All interior surfaces shall have flame spread index of 25 or less.
2. Cabinet / Exterior Panels
 - a. Cabinet exterior panels shall be powder coated sheet steel.
3. Inner Liner
 - b. Liner material shall be suitable for chemicals of use and maximum temperature.
 - c. Liner material shall be RFP unless indicated otherwise within project documents.
4. Work Surface
 - a. Work surface material shall be suitable for application.
 - b. Work surface shall be solid epoxy for standard applications unless indicated otherwise.
 - c. Work surface shall typically be type 316 stainless steel or PVC for non-standard applications as appropriate for chemicals used.
5. Airfoil
 - a. Airfoil shall be type 316 stainless steel or same material as hood liner unless indicated otherwise.
6. Fasteners
 - a. Fasteners shall be type 316 stainless steel.
7. Sash
 - a. Sash opening shall be framed with material suitable for purpose.
 - b. Sash window shall be ¼" acrylic plastic or tempered glass.
 - 1) Wired glass not allowed.
 - c. Sash tracks and guides shall be PVC, stainless steel or other inherently chemical resistant material.
8. Baffle
 - a. Baffle shall be same materials as fume hood liner unless indicated otherwise in project documents.
9. Duct Connection
 - a. Duct collar shall be type 316 stainless steel.
9. Service Fittings
 - a. See section below entitled *SERVICE FITTINGS* for requirements.
10. Cup Sinks
 - a. Cup sink and turret shall be suitable for service.
11. Piping
 - a. Type K copper tubing shall be used for water service.
 - b. Stainless steel tubing shall be used for deionized water service.
 - c. Type K copper with 15% silver solder joints shall be used for vacuum and air service.
 - d. Schedule 40 black iron pipe shall be used for gas service.

- e. Piping for other service shall be as appropriate for service.
- f. All piping shall be of domestic manufacture.

12. Filler Panels

- a. Same material and coating as fume hood.

2.2 RADIOISOTOPE HOODS

A. Same as standard chemical fume hoods with following additions:

1. Hood Design

- a. Work surface shall be dished, integral to hood. All corners shall be covered.

2. Materials

- a. All materials shall be impervious to radioactive materials.
- b. Work surface and liner shall be smooth welded stainless steel unless indicated otherwise in project documents.

3. Identification

- a. Fume hood shall be prominently labeled: *RADIOISOTOPE / RADIOCHEMICAL*

2.3 PERCHLORIC ACID HOODS

A. Same as standard chemical fume hoods with following additions:

1. Hood Design

- a. Work surface and all interior surfaces potentially exposed to moisture shall be watertight.
- b. Work surface shall be dished, integral to hood, pitched toward back of hood. All corners shall be covered.
- c. Integral trough with drain connection shall be provided at rear of hood to collect wash-down water.
- d. Spray nozzles and piping shall be provided for complete wash-down.
 - 1) Wash-down controls shall be provided. Such shall be coordinated with external fan and duct wash-down system.
- e. Wash-down system external to hood shall be provided by others. (See *Part 3 – EXECUTION* for wash down system requirements external to hood.)

2. Materials

- a. Inside surfaces of hood as well as all ductwork shall be stable and non-reactive with perchloric acid.
- b. Surfaces shall not support formation of corrosive, flammable and/or explosive compounds or byproducts.
- c. Work surface and inner liner shall be:
 - 1) Unplasticized PVC for corrosion resistance
 - 2) Type 316 stainless steel for high temperature applications (above 140F)
 - 3) Ceramic-coated material if indicated

[Note to PSC: Identify material for specific project as appropriate.]

3. Identification

- a. Fume hood shall be prominently labeled: PERCHLORIC ACID

2.4 SERVICE FITTINGS

- A. Service fittings and faucets shall be provided as indicated.
 - 1. General service fittings and faucets shall be brass construction with polished chrome finish.
 - a. Special service fittings shall be designed for service.
 - 2. Faucets shall be gooseneck type with vacuum breaker.
 - 3. General service valves shall be extruded brass with bronze stem and TFE seals and packing.
 - a. Special service valves shall be designed for service.
 - 4. Valve handles shall be color coded and labeled for designated service as follows:

Service	Indexing	Button Color	Lettering Color
Cold Water	CW	Green	White
Hot Water	HW	Red	White
Air	AIR	Blue	White
Gas	GAS	Orange	White
Vacuum	VAC	Yellow	White
Distilled Water	DW	White	Black
Steam	Steam	Black	White
Oxygen	OXY	Lt. Green	White
Nitrogen	N2	Gray or Brown	Black or White

2.5 FUME HOOD BASE CABINETS

- A. Base Cabinets
 - 1. Base cabinets shall be provided in type and width indicated.
- B. Non-Chemical General Storage Cabinets
 - 1. General storage cabinets shall have following features:
 - a. Epoxy-coated steel construction
 - b. Capable of supporting 800 lb.
 - b. Flat or dished work surface as specified for hood
 - c. Full depth shelf
 - d. Manual closing, non-locking hinged doors
 - e. Filler panels as required to increase cabinet depth
- C. Acid Storage Cabinets

1. Acid storage cabinets shall be specifically designed for storage and venting of acids and other corrosive liquids.
2. Acid storage cabinets shall provide features of general storage cabinet with following additions:
 - a. 2" galvanized steel vent pipe with NPT connections
 - 1) Pipe extended to fume hood exhaust ductwork.
 - 2) 1/4" mesh hardware cloth interior screen
 - b. Polyethylene-lined interior
 - c. Acid resistant shelf
 - d. PVC bottom liner tray
 - e. Self-closing, lockable hinged doors
 - f. Identification label
 - 1) ACID - CORROSIVE

D. Base Storage Cabinet

1. Base storage cabinet same as acid storage cabinet
 - a. Identification label
 - 1) BASE - CORROSIVE

E. Solvent Storage Cabinets

1. Solvent storage cabinets shall be specifically design for storage of flammable and combustible liquids.
2. Solvent storage cabinets shall have following features:
 - a. Double wall steel construction on all sides including top, bottom and door(s)
 - b. All joints welded or screwed
 - c. Chemical resistant epoxy coating
 - d. Two diametrically opposed flame arrester vents
 - e. Full depth adjustable steel shelf, sealed leak tight
 - c. Self-closing, self-latching door(s)
 - d. Right hand door, three point latching device
 - e. Locking lever handles
 - f. Identification label: FLAMMABLE - KEEP FIRE AWAY

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Fume hoods and base cabinet assemblies (hereafter referred to as fume hoods) shall be configured and installed at locations indicated on drawings.
- B. Fume hoods and cabinets shall be installed in accordance with shop drawings and Manufacturer's written instructions.
- C. Installation shall be coordinated with other Contractors to facilitate installation of plumbing and electrical services.
- D. Fume hoods shall be installed level, plumb and true.

1. Hoods shall be shimmed as required using concealed shims.
- E. Fume hoods shall be securely anchored to building and adjacent laboratory casework.
- F. Fume hood exhaust duct shall be connected and sealed. Coordination with Ventilation Contractor shall be provided.
- G. Base cabinet vent pipe shall be extended from cabinet and connected independently to exhaust system. Vent pipe shall be concealed within fume hood wall cavity.
- H. Access panels shall be firmly attached in manner that allows easy removal and secure reattachment.
- I. Where fume hoods abut other finished work, apply filler strips and panels with concealed fasteners.
- J. Neighboring splash blocks shall not be attached directly to hood.
- K. Minor damage shall be touched up after installation is complete. Damaged components shall be replaced as directed by AE.
- L. Moving parts shall be adjusted for smooth accurate sash operation and uniform contact with rubber bumpers.
- M. Proper operation of hood in conjunction with lab ventilation control system and fume exhaust system shall be confirmed.

3.2 FUME HOOD DENSITY GUIDELINES

- A. Total area of fume hood openings with sash in fully open position shall not exceed 10% of room square footage.
- B. Total area of fume hood openings with sash at maximum operating height (typically 18") shall not exceed 5% of total room square footage.
- C. Fume hood density may be increased via No Diffuser Zone (NDZ) overlap given design conforms to hood placement guidelines.

3.3 FUME HOOD PLACEMENT GUIDELINES

- A. Fume hoods shall be located at back of labs or in alcoves to extent feasible.
- B. Minimum 4 ft between shall be provided between fume hoods and adjacent doors relative to same wall.
- C. Hoods shall have distance of at least 8 feet from doorways when facing doorway.
- D. Fume hoods shall not be located within 3 ft. of obstructions that cause undesirable airflow patterns at plane of the sash.
 1. For example: refrigerators, freezers, incubators
- E. Hoods shall be located at least 4 ft. from main traffic aisle.
- F. Hoods shall be located at least 4" from adjacent walls.
 1. Exception: If design prevents spatial variations in face velocity from wall effects.
- G. Fume hoods shall not face each other.
 1. Within distance of less than minimum hood width
 2. Within 5 ft. from sash plane to sash plane.
- H. No recommendation for distances between adjacent fume hoods.

3.4 SUPPLY DIFFUSER PLACEMENT GUIDELINES

- A. Placement of supply air diffusers shall avoid No Diffuser Zones (NDZ)

1. NDZ is defined as area 5 ft. in front of and on either side of fume hood.
 2. Exceptions:
 - a. If diffuser is required for room air circulation
 - b. Supply air from diffuser does not impact fume hood performance
- B. Only laminar flow diffusers shall be used. Typically radial or hemispherical in design.
1. Standard “mixed air” induction type louvered or perforated face diffusers shall not be used.

3.5 EXHAUST SYSTEM

- A. Exhaust Fan (Specified separately and provided by others. See *Section 23 34 00 – HVAC Fans.*)
1. Integral blowers not allowed.
 2. Exhaust fan shall be remote, roof mounted, spark resistant.
- B. Ductwork (Specified separately and provided by others – See *Section 23 31 00 – HVAC DUCTS.*)
1. Welded stainless steel, 18 gauge minimum unless indicated otherwise.
 - a. Dedicated branch ducts shall be round type 316L stainless steel unless indicated otherwise in project documents.
 - b. Main ducts in manifolded systems may be type 304 stainless steel unless indicated otherwise. (Dilution typically substantial in main ducts.)
 2. Acoustical Design
 - a. Exhaust system shall be designed to limit noise to NC 50 maximum within laboratory.
 - b. If attenuators must be used they shall be constructed of type 316 stainless steel and shall be “packless” type.
- C. Laboratory Controls
1. Air valves and laboratory control system provided by others.

3.6 SPECIAL REQUIREMENTS - RADIOACTIVE / RADIOISOTOPE HOOD

- A. Radioactive / radioisotope hood exhaust systems (fans and ductwork) shall be dedicated to such application and shall not be ganged with exhaust systems serving other hood types.

3.7 SPECIAL REQUIREMENTS - PERCHLORIC ACID HOOD

- A. Perchloric acid hood exhaust fan and ductwork shall be dedicated to individual hood.
- B. Exhaust Fan (provided by others)
1. Exhaust fan shall be acid resistant and spark resistant.
 2. Exhaust fan motor shall not be located within contaminated air stream.
 3. Direct drive fan preferred.
 4. If belt-driven, belts shall be conductive and shall not be located within ductwork.
 5. Flexible connectors shall not be used.
 6. Fan housing drain piping shall be extended to appropriate drain.
 7. Acceptable manufacturers for exhaust fans for perchloric acid systems
 - a. M.K. Plastics

- b. Plasticair
 - c. Labconco
 - d. IPF Calasit
- C. Ductwork (provided by others)
- 1. Ductwork shall be constructed of materials stable, non-reactive with perchloric acid and/or its byproducts.
 - 2. Ducts shall be constructed of non-metallic materials such as fiber reinforced plastic (FRP).
 - 3. Ductwork shall be kept as short as possible with minimum number of elbows.
 - 4. Ductwork shall be pitched toward hood providing positive drainage.
- D. Water Wash-down System (provided by others)
- 1. Spray nozzles shall be provided in fan and throughout ductwork as required to water-wash entire exhaust system.
 - 2. Water piping and control infrastructure shall be provided as required to serve system.
 - 3. Automated drains shall be provided to prevent outdoor pipe freezing.
 - 4. System zoning shall be employed as required to prevent exceeding hood drain capacity.

END OF SECTION 11 53 1313

This section of the *U of I Facilities Standards* establishes minimum requirements only.
It should not be used as a complete specification.