## Part 1 General

### 1.1 Summary

.1 Unless otherwise indicated, follow the standards below when specifying chemical fume hood modifications or installations. These standards are not intended to restrict or replace professional judgment. Refer also to section “Laboratories” in Special Building Areas in McGill Buildings Design Standards.

### 1.2 Design Requirements

.1 General Requirements

.1 All new laboratory fumes hoods shall conform to the CSA standard Z316.5-04 “Fume Hoods & Associated Exhaust Systems”.

.2 All hood sashes shall be vertical sashes.

.3 New fume hoods shall be inspected and approved by a qualified expert before start-up

.4 Hot lab radioactive exhausts and biohazard exhausts shall run continuously.

.5 Only hot lab exhausts shall be connected to emergency power.

.6 Design Configuration: variable air volume, air foil or bevelled sides and sill shatterproof sash, adjustable upper and lower baffles, hood work surface recessed (dished) to contain liquid spill, electrical outlets and utility values on exterior face, ground fault interrupter on electrical outlet circuit.

.7 Radioactive Hoods shall have non-porous interiors (e.g. stainless steel) and activated charcoal filters for iodination experiments (for other radioisotopes, consult with Radiation Safety Officer).

.8 All fume hoods shall be equipped with a flow monitor, SIEMENS or PHOENIX. The response time with respect to the opening or closing of the hood sash shall be two seconds or less.

.9 See also: www.mcgill.ca/ehs/laboratory/lab-design-guidelines and the Special Building Areas - Laboratories section of "McGill Design Standards". In the case of disparity between the sections, it will be required to ask for clarification from the Building Operations mechanical maintenance engineer, Facilities Management and Ancillary Services McGill.

.2 Fume Hood

.1 A fume hood is a safety device that protects the laboratory personnel from undesirable effluents. Also, it carries out toxic vapour of the building.

.2 The only types of fume hood accepted at McGill University are the following: bench top hood, radioisotope air hood and perchloric acid hood.

.1 Bench Top Hood

.1 This type of fume hood is generally placed on a bench top or above a storage cabinet.

.2 Bench top hood shall be used with small to moderate quantities of low to highly toxic material.

.2 Radioisotope Hood

.1 This type of fume hood is used for Beta and Gamma radiation.

.2 The work surface and interior lining shall be Type 304 stainless steel with welded seams.

.3 Perchloric Acid Hood

.1 This type of fume hood shall be used for perchloric acid manipulation only.

.2 The interior lining shall be Type 316 stainless steel with welded seams or seamless technical ceramic liner.

.3 The ventilation system connected to this fume hood shall be in Type 316 stainless steel.

.4 The hood, duct, and fan shall have a water wash down system. Drain outlet shall handle a minimum of 56.8 litres per minute.

.5 The fume hood line shall have no access holes.

.6 A perchloric acid hood shall never be tied to a manifold system.

.3 Other Ventilated Laboratory Safety Devices

.1 These devices are special purpose hoods that are modifications of fume hoods.

.1 Demonstration Hood

.1 A demonstration hood shall be used to provide visibility of the hood interior from multiple sides.

.2 Ventilated Enclosure

.1 The ventilated enclosures are separated as the following: oversized hood, table-top hood, conventional hood, balance enclosure, microscope enclosure, robotic enclosure and histopathological enclosure.

.1 Oversized Hood

.1 Oversized hood are non-standard sizes to accommodate a specific application.

.2 Table top Hood

.1 Table top hood is small and used for mounting on a tabletop.

.3 Conventional Hood

.1 This device exhibits a square entry profile.

.4 Balance Enclosure

.1 It is used to house a laboratory balance.

.2 The enclosures are made of transparent materials.

.5 Microscope Enclosure

.1 It is used to house a laboratory microscope.

.2 The enclosures are made of transparent materials.

.6 Robotic Enclosure

.1 It is used to house a laboratory robot or automated equipment.

.2 The enclosures are made of transparent materials.

.7 Histopathological Enclosure
- .1 It is used for histopathological operations.
- .2 The enclosures are made of transparent materials.

.4 Local Exhaust Ventilation Devices
- .1 Canopy Hood
  - .1 It is a ventilated enclosure suspended directly above the work area.
- .2 Slot Hood
  - .1 It is positioned adjacent and at right angles to the work area.

.5 Biological Safety Cabinets
- .1 Class I Cabinets
  - .1 It shall be equipped of HEPA filter if exhaust air is recirculated into the laboratory.
- .2 Class II Type A1 Cabinets
  - .1 The intake shall be mixed with recirculated air and HEPA filtered down flow air. A minimum of 75 FPM inflow is required.
  - .2 The exhaust air shall be HEPA filtered and back into the laboratory.
  - .3 The ventilation system shall have positive pressure duct systems.
- .3 Class II Type A2 Cabinets
  - .1 The intake air shall be mixed with recirculated air and HEPA filtered down flow air. A minimum of 100 FPM inflow is required.
  - .2 The exhaust air shall be HEPA filtered and back into the laboratory.
  - .3 The ventilation system shall have negative pressure duct systems.
- .4 Class II Type B1 Cabinets
  - .1 The intake air shall be HEPA filtered, largely uncontaminated recirculated air. A minimum of 100 FPM inflow is required.
  - .2 The exhaust air shall be exhausted to the atmosphere through a dedicated duct system.
  - .3 The ventilation system shall have negative pressure duct system or surrounded by a negative pressure duct.
- .5 Class II Type B2 Cabinets
  - .1 The intake air shall be HEPA filtered, non-recirculated, down flow air. A minimum of 100 FPM inflow is required.
  - .2 The exhaust air shall be exhausted to the atmosphere.
  - .3 The ventilation system shall have negative pressure duct system or surrounded by a negative pressure duct.

**1.3 Pressurized Exhaust Ventilation System**

.1 The laboratories with fume hoods shall be at a relative negative pressure to adjacent spaces in the building. (Exception)

.2 See article 4.4-Laboratory design criteria, section “Laboratories” - Special Building Areas in McGill Buildings Design Standards for the ventilation rates.

.3 Heat must be recovered from the laboratory exhaust air. The designer shall provide the most efficient heat recovery system. This notwithstanding, the most appropriate system shall be identified by hazard analysis so as to limit carry-over and cross contamination as per ASHRAE 62.1.

.4 The exhaust unit shall be located on the roof of the building.

.5 The types of laboratory exhaust systems accepted at McGill University are By-Pass and Variable Air Volume.

.6 All fume hood discharge shall be vertical. Fume hood stacks shall be a minimum of 10 feet tall with a discharge outlet no less than 10 feet above the roof deck.

.7 Fume hood outlets shall be a minimum of 25 feet away from any adjacent window or air intake.

.8 Chemical exhaust outlet velocity shall be 4,000 fpm. minimum, for ventilated cabinets.

.9 Fume hood exhaust outlet velocity shall be 6,000 fpm. minimum.

.10 Fume hood exhaust ducts shall be stainless steel (verify type).

**1.4 Hood Services**

.1 The different hood services used at McGill University are gas, water, air, vacuum and steam.

.2 The piping for the different services shall respect the following:

- Water-copper.
- Gas – wrought iron or steel (galvanized or black) or yellow brass (containing not more than 75% copper).
- Air- copper-black iron can be used as an alternate.
- Vacuum- copper-black iron can be used as an alternate.
- Specialty Gas-appropriate materials as specified.

.3 The different services shall be identified. All colour coding and letter coding shall respect the following:

| Service | Letter Coding | | Colour Coding |
|---|---|---|---|
| | English | French | |
| Cold Water | CW | EF | Green |
| Hot Water | HW | EC | Red |
| Distilled Water | DIW | ED | White |
| Deionized Water | DEW | EDI | White |
| RO Water | ROW | EOI | White |

| | | | |
|---|---|---|---|
| Vacuum | VAC | VAC | Yellow |
| Compressed Air | AIR | AIR | Orange |
| Propane | PRO | PRO | Yellow-Orange |
| Natural Gas | NG | GN | Yellow-Orange |
| Oxygen | OXY | OXY | Green |
| Nitrogen | NG | AZ | Blue |
| Argon | A | AR | White |
| Steam | ST | VAP | Black |

**1.5 Fire Suppression System**

.1 If there is a very high risk of fire, the fume hood shall be equipped of a fire suppression system.

.2 Fire suppression system shall be FIRETRACE or equivalent.

**1.6 Testing Requirements**

.1 Provide commissioning for each newly installed or relocated fume hood – see article 4.2.6-Commissioning, section “Laboratories” - Special Building Areas in McGill Buildings Design Standards.

.2 Tests shall be conducted with the laboratory activity in a normal state.

.3 All HVAC systems shall be complete and in normal operation test.

.4 Position of the sash shall be at the specified opening. By the manufacturer.

.5 Measure a 1.0 ft.$^2$ grid pattern across the sash openings by equally dividing the opening into vertical and horizontal dimensions.

.6 With the sash fully open, obtain face velocity readings at the centre of each grid space by holding the anemometer in the plane of the hood sash and perpendicular to the sash opening (standing to the side).

.7 Calculated mean face velocity as per ANSI/ASHRAE 110-1995 (or most recent version)

.8 Record fume hood information on the field data sheet.

.9 Repeat steps 4 through 7 lowering the sash until the average face velocity is 100 fpm. Record the sash height on the field date sheet. NOTE: if the sash opening is less than 14 inches, the fume hood shall be deemed inoperative and a “DO NOT USE” notice posted.

.10 Lower sash to 50% opening and repeat measurements.

.11 Conduct a pencil smoke test, release smoke around the sash and under sash bar and ventilated cabinet if any,

.12 Fume hood test data shall be entered from the field data sheets into the computer database; and, any corrections or needed repairs shall be noted and appropriate action taken.

.13 Post certification stickers with fume hood test results.

.14 Post an arrow label indicating the maximum sash opening at the height at which 100 fpm is achieved.

.15 Apply a similar label to indicate position of dampers if applicable.

.16 Determine fan static pressure, rotational speed of fan impeller, fan motor current and voltage and compare them with the manufacturer's fan curves.

.17 Record all readings on an approved report form.

.18 In addition to the paper document, a PDF document is required.

**1.7 Fume Hood Face Velocity Verification**

.1 McGill chemical fume hoods will be evaluated annually according to the following:

| Criterion | Standard |
|---|---|
| Instrument | Short Ridge AMD 860 air meter or approved equivalent |
| Grids | At least two; no greater than 12" x 12" in size |
| Average Face Velocity | 100 FPM +/- 10 fpm for conventional systems<br>90 fpm +/- 10 fpm for VAV systems with airflow indicators and alarms |
| Range | No measurement <10% of average; <15% variation point to point |
| Baffles, dampers | Adjust for uniform flow if necessary |
| Smoke | Use smoke pencil to verify the hood as directed |
| Identification | Hoods that pass will be labelled in with the hood number, average face velocity, and date of test and be labelled with an arrow indicating the sash height that should not be exceeded. |
| Fan Characterization | Measure and record fan performance |

**END OF SECTION**