

**Part 1 General****1.1 Summary**

- .1 Unless otherwise indicated, follow the standards below when specifying Laboratory Fume Hoods. These standards are not intended to restrict or replace professional judgment.
- .2 The Project Manager will liaise with the end users for project specific needs. Consult with the Project Manager to obtain general layout and specific requirements.

**1.2 Content**

- .1 Are included in this section:
  - .1 Laboratory Fume Hoods;
  - .2 Base Furniture for Laboratory Fume Hoods.
  - .3 This section does not address the use of ductless recirculation fume hoods, biological safety cabinets (BSCs) or clean air benches which must not be used for the control of chemical hazards. For information on BSCs refer to McGill Biosafety Manual.

**1.3 Related McGill Guidelines**

- .1 Special Building Areas – 8. Laboratories
- .2 Furniture (section 12 50 00)
- .3 Laboratory Casework (section 12 35 53)
- .4 Chemical storage cabinets (section 12 35 54)
- .5 Chemical Fume Hood – HVAC (section 23 38 17)
- .6 McGill EHS Laboratory Design Guidelines  
<http://www.mcgill.ca/ehs/laboratory/lab-design-guidelines>
- .7 McGill Laboratory Safety Manual:  
<http://www.mcgill.ca/ehs/laboratory>
- .8 McGill Radiation Safety Policy Manual:  
<http://www.mcgill.ca/ehs/laboratory/radiation/manual/>
- .9 McGill Biosafety Manual:  
<http://www.mcgill.ca/ehs/laboratory/biosafety/manual/>
- .10 McGill Laser Safety Manual:  
<http://www.mcgill.ca/ehs/laboratory/laser-safety/laser-safety-manual>

**1.4 Coordination:**

- .1 Proper coordination of Mechanical and Electrical connections must be done from the preliminary design stage.

**1.5 Manufacturer / Installer Qualification**

- .1 Manufacturer / Installer must be recognized as specializing in the manufacture and installation of Laboratory Casework and Laboratory Fume Hoods:
  - .1 Be a member of SEFA (Scientific Equipment and Furniture Association);
  - .2 Have a 5 years' minimum experience in the industry;
  - .3 Have a proven track record of on time delivery and installation of projects of similar scale and type.

**1.5 Warranty**

- .1 Three (3) years manufacturer's warranty for material defects, faulty workmanship, faulty installation, faulty functioning, including replacing and in-shop refinishing.

**Part 2 Products****2.1 Performance**

- .1 Laboratory fume hoods and their base cabinets must be factory and in-situ tested according to the Codes and Standards mentioned in McGill's Laboratories Design Guidelines for New or Renovated Spaces, and:
  - .1 Conform to function-specific requirements;
  - .2 Meet or exceed SEFA's requirements;
  - .3 Be factory and in-situ tested according to SEFA's procedures;
  - .4 Meet or exceed Public Works Canada's Guidelines MD 15128 Laboratory Fume Hoods;
  - .5 Be factory and in-situ tested according to Public Works Canada's Guidelines MD 15128 Laboratory Fume Hoods procedures.
  - .6 Meet or exceed Public Works Canada's Guidelines MD 15129 Perchloric Acid Fume Hoods;
  - .7 Be factory and in-situ tested according to Public Works Canada's Guidelines MD 15129 Perchloric Acid Fume Hoods procedures.
- .2 Consult the Design Standard: Special Building Areas – Laboratories available on McGill's website for additional requirements for local exhaust ventilation.
- .3 The installation of laboratory fume hoods must be certified by a professional Engineer.
- .4 Acceptable suppliers: Waldner, Bedcolab, Mottlab, or approved equivalent.

**2.2 Materials**

- .1 Minimal metal gauges for pre-painted furniture grade Cold Rolled Steel (CRS) or Stainless Steel (SS):
  - .1 18 gauge (1,21mm/.048"CRS, 1,27mm/.050"SS): exterior shell, top closure panels, base furniture, sash handles, duct stubs, baffles, exhaust duct collar;
  - .2 16 gauge (1,52mm/.060"CRS, 1,59mm/.063"SS): interior panels, airfoil;

- .2 Paint finish: factory applied, chemical resistant thermosetting polyester enamel, sprayed applied by electrostatic process, and baked;
- .3 Stainless steel: type 316, no 4 finish (satin);
- .4 Sealant: chemical and mildew resistant;
- .5 Glass: laminated safety glass, 6,4 mm thick (¼");
- .6 Fiberglass reinforced plastic (FRP): 6,4 mm thick (¼");
- .7 Fasteners for interior and exterior: type 316 stainless steel, screws must be counter sink type, exposed fasteners are not acceptable; Do not use metals that are corrosive or incompatible with materials joined;
- .8 High density polyethylene (HDPE): white, 6,4 mm thick (¼");
- .9 Phenolic resin: UL approved, compact solid grade laminate in thicknesses from 6-20 mm with both black and white decorative layer, flame-spread index of 5 or less, and a smoke developed index of 20 or less, according to UL 723 (ASTM E83);
- .10 Glass-fiber-reinforced polyester: polyester laminate with a chemical-resistant gel coat on exposed faces, flame-spread index of 25 or less according to ASTM E84;
- .11 Polypropylene: extruded to molding compound standard according to ISO 19069-1; Food compliance by FDA;
- .12 The removable front filler panels between the top of the hoods and the underside of ceilings are permitted to be in thermoset melamine panels with polypropylene edgebanding.

### **2.3 Laboratory Fume Hoods**

- .1 Fume hood types in order of preference, as per project requirements:
  - .1 Ultra Low Flow VAV Fume Hoods:
    - .1 The term “ultra low flow” should only be attributed to a fume hood that can guarantee proper containment (level of cross contamination) equal or superior to the highest standards published by the ASHRAE 110 protocol with a maximum face velocity of 60 feet per minute (0.3 m/s). This coming from AI «As Installed» or AU «As Used» tracer gas containment testing results. AM «As Manufactured» testing will not be considered nor accepted because this type of testing does not consider any environmental conditions of the lab space in question.
  - .2 Variable Air Volume (VAV) Fume Hoods:
    - .1 Combined with an HVAC control system to vary the hood’s exhaust rate to maintain a constant average face velocity throughout the sash level.
  - .3 Constant Air Volume Fume Hoods:
    - .1 Equipped with an air deflector system that controls the incoming air velocity, thus providing a constant air exhaust volume.
- .2 Fabrication requirements:
  - .1 Laboratory Fume Hoods must be manufactured with factory applied paint finish on all exterior surfaces, including the back;
  - .2 Laboratory Fume Hood must be double wall construction and consisting of an exterior shell and a corrosion resistant interior lining on a self-supporting heavy-duty

- galvanized steel structure. Exterior and interior panels must be independently mounted and easily removable;
- .3 The inner structure of the walls must permit electrical and plumbing service fittings to be mounted on the exterior of the vertical front stiles. Plumbing and electrical must be factory pre-installed;
  - .4 Service fixture valves and boxes must be housed and concealed within the service chase on both sides of the hood, underneath the worktop or on the rear wall of the hood;
  - .5 Wall opening around sash must have an aerodynamic profile to minimize turbulence of air intake;
  - .6 Fume Hood must be rigid and fabricated to allow unit relocation at any time;
  - .7 All visible edges must be bend and all corners rounded (12mm radius);
  - .8 All fittings and trims in fume hoods must be corrosion resistant. Plated finishes are not acceptable;
  - .9 Interior access panels must be removable and easily replaceable without special tools;
  - .10 Side panels and filler panels: one piece, no visible perforation or mechanical fasteners;
  - .11 All Fume Hood must be of the counter top mount type and designed to mount on a 760mm (30") deep work top;
  - .12 Work surfaces must be completely sealed at all junctions with interior panels and other adjoining component, and be recessed at least 12,7mm (½") to contain spills;
  - .13 Width should match the laboratory benches modules (preferred width is 1525mm (60"));
  - .14 Noise level should not exceed 55dBA measured at working position;
  - .15 Noise level for Ultra Low Flow VAV Fume Hoods should not exceed 65 dBA measured at a distance of 915mm (36") directly in front of it and considering the sash opened to its max operating height, 500mm (20"), and with at a face velocity of 0.2 m/s (40 feet per minute);
  - .16 Monitoring device: Each fume hood must be equipped with an audible and a visual alarm for indicating the face velocity and the static pressure have fallen below the recommended set point. It is recommended that a display indicating the fume hood's status (ON/OFF) and face velocity be installed on each fume hood. The designer shall confirm with lab users whether such display is required;
  - .17 All hoods must be equipped with a locking system allowing the addition of a padlock in the case of fume hood shut down.
- .3 Chemical Fume Hoods:
- .1 Exterior:
    - .1 Prepainted cold rolled panels:
      - .1 One piece,
      - .2 Easily removable, without special tools, for maintenance access to sash mechanism and services lines and fixtures,
    - .2 Top closure panels to conceal visible ductwork;
    - .3 By-pass grille: same material as exterior panels.
  - .2 Interior:

- .1 Fiberglass reinforced plastic (FRP) panels or Stainless steel panels, as per project requirements:
  - .1 Fiberglass reinforced plastic (FRP) panels:
    - .1 Heat and Chemicals resistant,
    - .2 Non-porous white surface finish;
  - .2 Stainless steel panels:
    - .1 All welded construction, ground smooth,
    - .2 Integral with work surface,
    - .3 With seamless coved corners of 12mm radius;
- .2 Interior access panels:
  - .1 One access panel on both sides;
  - .2 With vinyl gaskets;
  - .3 Access panels and gaskets removable and replaceable without special tools.
- .3 Sash:
  - .1 Vertical sliding sash;
  - .2 Security glass;
  - .3 Sash guides: type 316 stainless steel running in a corrosion resistant PVC track;
  - .4 One window for fume hoods 2440mm (8') wide or less;
  - .5 In application where heat is a potential source of danger, a mylar© overlay should be installed on the exterior surface of the glass;
  - .6 Counterbalance mechanism:
    - .1 Spring counterbalance is not acceptable;
    - .2 Specify single counterweight wire on pulley:
      - .1 3mm (1/8"), type 316, stainless steel stranded cables;
      - .2 Pulley assembly: 38mm (1 1/2") nylon roller with steel ball bearing and cable retaining device;
      - .3 Counterweight must be designed so the sash cannot fall within 50mm (2") of the sash opening bottom;
    - .3 Sash must latch when fully open and when released must automatically close by gravity;
  - .7 Specify sash stop to prevent sash from opening further than its normal opening position,
  - .8 Handle: stainless steel, full width of glass, with aerodynamic profile to minimize turbulence of air intake;
  - .9 The sash should open and close against rubber bumper stops;
- .4 Work surface:
  - .1 Epoxy resin or Stainless steel panels, as per project requirements:
    - .1 Epoxy resin:
      - .1 Heat and Chemicals resistant,
      - .2 With coved corners and raised surface all around the work surface;

- .2 Stainless steel:
  - .1 All welded construction, ground smooth,
  - .2 Integral with interior panels surface,
  - .3 With seamless coved corners of 12mm radius;
- .2 Integrated sink:
  - .1 If a sink is required it must be integrated to the work surface with seamless joints.
- .5 Light fixture:
  - .1 Mounted on the exterior of the fume hood;
  - .2 Isolated from the interior of the fume hood by a safety lens resistant to heat and vapors;
  - .3 Serviced from the outside of the hood;
  - .4 Providing at least 860 lux (80 foot candles) at work surface;
  - .5 Switch flush-mounted in side post, in vapor proof / waterproof box;
  - .6 Light fixture must be T-8 fluorescent rapid start or LED.
- .6 Baffles:
  - .1 Must be of the same material as the interior panels;
  - .2 Must be factory set but fully adjustable,
- .7 Airfoil:
  - .1 A horizontal airfoil must be installed above the raised portion of the work surface, at the bottom of the sash opening. The Airfoil must cover the full width of the opening and project into the fume hood, beyond the plane of the sash. The sash should close on top of the Airfoil, leaving a minimum opening of 25mm (1") for entry of air.
- .8 Exhaust duct collar
  - .1 For connection to the exhaust duct, must be stainless steel.
- .9 Sash operating height:
  - .1 A label indicating the correct operating height must be affixed on the fume hood frame.
- .10 Information labels, controls and services placement:
  - .1 Must be consistent for all fume hoods in the same laboratory and, preferably, on a same floor, and same building;
  - .2 Fume hoods must be labeled with the same identification number of the related fan located on the roof.
- .11 Services
  - .1 The fume hoods must be manufactured to accommodate at least:
    - .1 Two duplex 120V/15A electrical outlets;
    - .2 Ten plumbing fixtures.
  - .2 The supply of services in the fume hood shall be designed in a modular way and shall be upgradable with easy means.

- .3 It is preferred that all Mechanical and Electrical Services are to come pre-fabricated and pre-assembled from the factory thus allowing for quick assembly onsite without the need of other trades.
- .4 Ultra Low Flow VAV Fume Hoods :
  - .1 Construction and characteristics as per Chemical Fume Hoods above, but with the following preferred features:
  - .2 Window sash handle exhaust:
    - .1 When sash is open, air flows into workspace preventing pollutant backflow out of fume hood. Sash operating mechanism, including release of sash stop, can be operated with one hand at any point along the sash;
  - .3 Automatic sash:
    - .1 Sash closes automatically when there is nobody present at the fume hood after a programmable time limit (between 20 seconds and 20 minutes). A photo-electric barrier stops the closing process if there are objects protruding from inside the workspace; No external switches or buttons;
  - .4 Airflow indicator and alarm:
    - .1 Manufacturer's standard airflow indicator with audible and visual alarm that activates when airflow sensor reading is outside of preset range;
  - .5 Sash alarm;
    - .1 Provide fume hoods with audible and visual alarm that activates when sash is opened beyond preset position. Provide with silence and test switches;
  - .6 Sash stops, with manual override:
    - .1 Provide fume hoods with sash stops to limit hood opening to 18 inches (according to ASHRAE 110) or 500 mm (according to EN14175). Sash stops can be manually released to open sash fully for cleaning fume hood and for placing large apparatus within fume hood;
- .5 Radioisotope fume hoods
  - .1 Construction and characteristics as per Chemical Fume Hoods above, with all welded stainless steel inside panels and integrated work surface. Work surface must be designed to support Lead Castle weight (at least 900kg);
  - .2 Duct work must be of type 316 stainless steel with smooth-welded seams;
  - .3 Duct work must take the shortest direct straight path to the outside.
- .6 Perchloric fume hoods:
  - .1 Construction and characteristics as per Chemical Fume Hoods above, with all welded stainless steel inside panels and integrated work surface, but:
    - .1 With no interior access panels (access to services must be from the outside of the fume hood);
    - .2 The rear baffles must be readily removable to inspect for chemical build-up and facilitate cleaning;
    - .3 Must be fitted with a wash down system;
    - .4 The light fixture must also be explosion proof;

- .5 A label mentioning “FOR PERCHLORIC ACID WORK ONLY” – “POUR USAGE AVEC ACIDE PERCHLORIQUE SEULEMENT” must be displayed on a conspicuous location on the fume hood;
- .6 Duct work must be of type 316 stainless steel with smooth-welded seams;
- .7 Duct work must take the shortest direct straight path to the outside.

## **2.4 Base Furniture for Laboratory Fume Hoods**

- .1 Metal construction, with same finish as the fume hood;
- .2 Fume hoods base furniture, casework or tables must be rigid and capable of supporting the weight of the fume hood, of its accessories and of the equipment and apparatus intended to be used within;
- .3 If ventilated storage cabinets are installed below the fume hoods, they must be ventilated independently from the fume hood;
- .4 Consult the Design Standard: Division 12 - Furnishing, Section 12 35 54 – Chemical Storage Cabinets available on McGill’s website for additional requirements.
- .5 Glassware drying cabinets are not acceptable under fume hoods.

## **Part 3 Installation**

### **3.1 Fume hoods installation**

- .1 Prior to the installation of the fume hoods, the base furniture and countertops must be levelled (1.5mm/3m (1/16” in 10’-0”) maximum deviation tolerance).

**END OF SECTION**