Provincial Lab Systems Limited

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Fume Hood Maintenance & Operation Manual

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Fume Hood Applications

If your fume hood is to protect you, it must be designed to be compatible with the type of work that will be performed. For example, working with radioisotopes or carcinogens requires a fume hood with a non-absorbent lining (usually stainless steel) designed to be easily decontaminated.

Only a specially designed laboratory fume hood should be used for perchloric acid procedures. This fume hood type should be clearly labelled and its use restricted to only perchloric acid procedures.

Other specialized applications may require explosion proof fixtures, electrical receptacles, non-combustible liner materials or fire extinguisher systems.

Never use a fume hood that has not been designed for the type of procedure being performed!

Common Fume Hood Types

Bench Fume Hoods:

Most common hood type used for general chemistry procedures. Specialized versions include; ADA Bench Hoods for access by handicapped personnel, OS Height Hoods with larger interior height for work requiring intermediate sized equipment, Radioisotope and Perchloric hoods as described above.

Walk-In Hoods:

A floor-to-ceiling fume hood for chromatography, distillation, pilot plant mock-ups, vat drug preparations and other procedures requiring large equipment inside the containment chamber.

Your Safety is our Top Priority!

Your new Fume Hood is the result of extensive research and development to design fume hoods that are economical, efficient and the safest on the market. The design, materials and construction are periodically reviewed to assure an even better and safer product.

But you, the fume hood operator, are the single most important safety feature in the laboratory.

No matter how safe the fume hood system is designed to be, the operator must follow certain procedures for it to work safely and efficiently.

We urge you to become familiar with the recommended fume hood practices outlined in this document in addition to those published by your organization but, most important, make a habit of applying them every day. We think you'll agree it's the best way to help ensure a safe, healthy work environment for you and your co-workers.

Our fume hoods, as manufactured, are the safest in the industry but we need your cooperation to keep them that way in your environment.

Maintain an appropriate attitude towards safety.

Every laboratory should have written procedures for handling emergencies such as:

- "Runaway experiments"
- Fire
- Explosion
- Power failure
- Blower failure
- Service fixture failure

These procedures should be posted in a prominent place and all laboratory workers must be familiar with them in order to react appropriately in an emergency situation.

"What if..." drills should be run when a fume hood is first installed, or when staff or procedures change. In surprising numbers of instances, misplaced fire extinguishers, inaccessible fuse boxes and blocked exits are only discovered during such a mock emergency.

Safety drills are not only for the new employee. Long-time employees need reinforcement of safety procedures also.

Aerodynamic Principle & Safety

A Fume Hood is designed to contain harmful contaminants and vent them out of the work space. It provides an enclosed area that has a protective air barrier between you and the harmful materials you work with. The directional air flow caries the contaminants towards the rear of the hood and dilutes them with large quantities of air to safely exhaust the hood.

<u>If anything disrupts this air flow, the fume hood's ability to protect you will be seriously reduced.</u>

Follow these important safety procedures to ensure proper air flow within the hood:

- **Use the illumination provided and be sure the hood is operational.**

Always turn on the interior light for proper illumination of the work area. Verify the exhaust system is working properly and that air is entering and flowing through the fume hood before starting fume producing activities. Be certain you know how to turn on the hood. In many facilities it is automatically controlled by the HVAC system. In others, control of each hood is local at an on/off switch located on or near the unit.

Verify you have a proper face velocity at or above 100 FPM through the sash opening you select before beginning fume-evolving activities. To confirm that your fume hood's exhaust system is working properly we recommend equipping the fume hood with an air flow monitoring device. Correct face velocity can be assured by periodically checking air flow with a hand-held velometer.

- **Set-ups and apparatus should be as far back from the fume hood face as is possible for safety and optimum performance.**

When you stand in front of the hood with the sash open, the airflow passing your body creates a zone of low pressure directly in front of you extending in about six inches. Since contaminants can enter this area of turbulence from inside the hood, all experiments and equipment should be placed at least six inches behind the plane of the sash, behind the protective air barrier. The further back you can place the source of contaminants, the greater protection a hood can provide. However, don't place items you're using so far back that you need to lean your head or face into the hood during procedures.

Aerodynamic Principle & Safety

- **Allow air flow at the work surface.**

Do not block the lower rear baffle slot of the fume hood. Large, bulky objects should not be placed directly on the fume hood working surface. Block such objects up two or three inches to permit a flow of air underneath and into the lower rear baffle exhaust opening.

- **Avoid rapid movement in front of the fume hood face.**

Avoid rapid movement and excessive personnel passage in front of the fume hood. Air disturbances so created may draw fumes out of the hood.

- **Operate the hood with the sash closed as much as possible.**

While working at the fume hood, open the sash only as far as you need to for access to your work area. The lowered sash increases the distance between your breathing zone and the area where fumes could escape into the lab. It also offers added protection by acting as a solid barrier against splashing chemicals or debris from explosions or runaway experiments.

- **Never store chemicals in the hood.**

Use of laboratory hoods as storage enclosures for corrosive, toxic or flammable materials may jeopardize fume hood performance and create unnecessary hazards. Limit materials within the hood to those required for immediate use.

Today, virtually all packaging is designed to safely contain reagents. Any leaky package should be disposed of immediately and appropriately, not stored in the fume hood. Clean up spills as soon as possible. Always use grounded electrical equipment.

- **Avoid extreme heat.**

Never permit the temperature of the sash surface to reach or exceed 160o F, as laminated safety glass cracks at this temperature.

Black hood liner material, such as epoxy, can also absorb invisible infrared light from heated objects and may crack under heat stress.

- **Maintain lab safety instructional materials.**

Design a videotape outlining your organization's safety procedures, and be sure new employees view this tape.

In summary, safety in fume hood operation involves three concepts:

- **Following accepted procedures.**
- **Avoiding questionable procedures.**
- **Maintaining the structural integrity of the equipment and the safety awareness of the laboratory staff.**

Clean Fume Hood = Safe Fume Hood

Periodic cleaning of the fume hood interior.

A neat and clean fume hood is not only aesthetically advantageous but also safer and easier to “shut down” in case of an emergency! Clean up any chemical spillage as soon as possible. All worktops recommended by Provincial Lab Systems are “dished” to help contain spills. Use only cleaning materials recommended for use in conjunction with the procedures being conducted within the hood. By keeping the fume hood clean, the chemical residues of your procedures will have less time to potentially damage the internal components, thereby minimizing the risk of a possibly catastrophic failure of a key hood component.

The following are basic cleaning and maintenance procedures which can be performed by the fume hood operator. Confirm that the cleaning agents being used will not react with the chemicals being used in the hood.

CLEANING

- **Polyglass Liner:**

Can be cleaned with mild soap and water.

- **Sash Glass:**

Can be cleaned with a commercial glass cleaner.

- **Painted Steel Surfaces:**

Can be cleaned with mild soap and water, ethyl alcohol or commercial glass cleaner.

- **Epoxy Liner and Worktops:**

Can be cleaned with mild soap and water, solvent or commercial glass cleaner.

- **Plumbing Fixtures:**

Fixtures are coated with a corrosive resistant coating. Clean with mild soap or detergent only. Do not use an abrasive cleanser.

Basic Maintenance

Schedule frequent maintenance checks of the condition of sash components, exhaust system and load bearing parts.

The very nature of the materials used in a fume hood, harmful or corrosive chemical fumes, can lead to deterioration of the fume hood's components due to the long-term effects of any chemical reactions. Any metallic load-bearing member inside the hood needs to be checked frequently for corrosive deterioration. Be aware of vertical sash counterbalance systems utilizing cables that can release the sash in guillotine fashion of the cable snaps. Horizontal sashes have been known to break loose and cave into the hood when corroded suspension systems give way.

Newer style hoods by most manufacturers combat some of these problems by eliminating or chemically coating the metal parts in question. A chain driven sash counterweight systems eliminates the possibility of fraying cables or fractured pulleys.

BASIC MAINTENANCE

- **Sash:**

A properly balanced sash, at 50% open, should not move up or down without operator assistance. If the sash is out of balance, do not attempt to adjust it yourself. No portion of the sash mechanism is user adjustable. Contact the appropriate maintenance department for your facility or a Provincial Lab Systems representative.

- **Velocity Alarm:**

Test the velocity alarm daily by placing your finger over the thermistor reference hole on the front cover plate. Face velocity readout should quickly drop to zero and the audio alarm should sound.

- **Fans and Ductwork:**

Be sure your maintenance staff schedules frequent checks of the fume hood's fans and face velocities. Because the ductwork system is exposed to toxic and corrosive fumes, it is a vulnerable link in your lab's exhaust system and requires vigilant monitoring.

Instructions for Perchloric Fume Hoods

Perchloric acid, $HClO_4$, is unforgiving if not handled correctly. Its acidity is nominal but each molecule essentially carries around four extra oxygen atoms which like to react, burn, or explode; whichever is easiest.

Concentrated perchloric acid should never be heated. Old bottles of acid should be discarded as hazardous waste. It can be expected to react with most types of plastics, except PVC or Teflon.

Perchloric acid may form contact explosives with some shaft bearing lubricants. Only fluorocarbon lubricants should be used on perchloric acid fume hood exhaust fans. We recommend the exhaust streams for these hoods be dedicated and not mixed with other fume hood exhaust streams.

Periodic cleaning of the perchloric acid fume hood interior.

Due to the explosive and reactive nature of perchloric acid salts that accumulate in the hood and ductwork, the washdown system in your fume hood should be used after every use or at minimum, once a day. In continuous use applications washdown the hood at week's end.

Discontinue experiments in the hood and remove devices that could be damaged by water. Switch the exhaust system off, then turn on the washdown bar to flush water through the hood system. The rear baffles should be flushed for at least five minutes. Next, police the hood interior with a sponge, thoroughly rinsing the sponge to remove chemical residue. Be sure the hood interior is completely dry before replacing your equipment.

In most cases, the fume hood ductwork washdown system interfaces with the hood washdown system. Check with the appropriate party in your facility to determine how your system operates. Test the system with an empty hood before attempting a washdown procedure.

Other special considerations for perchloric acid hoods:

Any components used in conjunction with perchloric acid experiments, such as distillation racks, should be fabricated from stainless steel not aluminum.

Velocity Alarms

Air is drawn into the fume hood by its exhaust system which creates a pressure difference between the surrounding room and the hood interior. The speed of the air passing through the sash is called the face velocity. Proper face velocity is required to protect the operator and surrounding area from harmful components inside the hood.

Alnor Velocity Alarm

The Alnor AirGard 335 Velocity Alarm has audible and visual indicators.
In dangerous situations a continuous audible alarm will alert the operator. An electronic bar graph moves back and forth through universally recognized zones, red - yellow - green, as the velocity changes. Corresponding large coloured LEDs also illuminate.

Velocity Alarm Calibration Instructions

Calibration of Digital Velocity Alarm

1. Power up the alarm and set the switch to “Run”, calibrate as follows:
    a. There are three calibration potentiometer holes located on the alarm face plate.
    b. With the fume hood and make-up air off, turn the left most potentiometer (RP2) until the digital counter just moves off zero. Now turn the potentiometer back in the other direction until the reading barely returns to zero.

2. Turn the fume hood and make-up air on. Using the sash or damper adjustment, or both, set the face velocity at the desired sash setting to the desired alarm set point (10 to 100 FPM) using a velometer, not the velocity alarm.

3. Remove the alarm cover and select the one of the ten numbered DIP switches (SW1) that corresponds to your alarm set point. Move the DIP switch to the right (On position). Replace the alarm face plate.

4. Turn the set screw on the center potentiometer (RP1) until the alarm signal activates.

5. Using the sash or damper adjustment, or both, set the fume hood velocity to 100 FPM using a velometer, not the velocity alarm. Adjust the rightmost potentiometer (RP3) until the digital readout is 100 FPM. Alarm is now calibrated and ready for use.
Alarm is now set to digitally read the average face velocity and activate the alarm if the desired minimum value is not held.

Note: Audio alarm can be muted by activating the Mute switch, but the warning light cannot be turned off.

Calibration of Alnor Velocity Alarm

Please refer to the AirGard 335 owner's manual for proper calibration of this device or visit their website for manuals and information at www.alnor.com.

Procedures for Trained Personnel

The following maintenance items should be undertaken only by building maintenance, trained fume hood or HVAC installation personnel.

- **Periodic inspection of the ductwork system.**

At least twice a year the exhaust duct and fan integrity should be inspected. Check for localized corrosion, broken fan parts and debris clogs. If items such as tissue, paper or foil are used in the hood, it is possible for them to be drawn into the baffle/duct system, forming blockages that reduce air flow.

- **Periodic smoke tests.**

At least twice a year we recommend running a smoke test on each hood. Smoke sticks and other testing materials are available for purchase from Provincial Lab Systems Limited.

- **Periodic testing of the velocity alarm.**

At least once a year test the accuracy of the velocity alarm by using a hand held velometer.

- **If the sash glass breaks.**

Replacement sash units may be ordered through your Provincial Lab Systems representative. Do not attempt to replace.

Fume Hood Safety Labels

If the instructional label on your fume hood is missing or is illegible, please contact Provincial Lab Systems immediately for replacements.

Product Warranty

Provincial Lab Systems guarantees their fume hood products based on the manufacturers standard warranty from date of shipment, warrant that furnished products shall be free from defects in material and workmanship.