



Safety Procedures for Fume Hood Maintenance

Application:

Any planned maintenance or repair work on laboratory fume hood systems (fans or exhaust duct system) requiring shutdown of the fan. Note the special procedure for perchloric hoods.

Procedures:

1. Special Procedure for Perchloric Acid Hoods.

Perchloric acid hoods may contain explosive perchlorates, and the hood must be specially cleaned using water removal to ensure that these materials are not present before work commences. For all perchloric acid fume hoods a contractor who is a “competent person” through knowledge and experience as per the Ontario OH&S act must be used to remove all traces of perchloric acid and perchlorates. U of T personnel or other contractors must not carry out any work on these hoods or ductwork until such time as the hood has been tested for perchloric residues using the methylene blue and diphenylamine tests, or other appropriate tests acceptable to EHS. The contractor chosen to complete the clearance work must carry out the tests or an equivalent before releasing the hoods for further work (see Appendix A). In addition the contractor must provide a scope of work to the U of T representative overseeing the maintenance work before starting the cleaning of the ducts. Note that the requirements of the U of T Contractor Safety Program must be met at all times.

General Procedure

1. Trades/Utilities will notify the Department/Laboratory:
 - Of the nature of the upcoming service/maintenance work to the fan.
 - That all fume hoods connected to the fan will be out of service for the duration of the service/maintenance work.
 - That these fume hoods must be emptied of all chemicals or other hazardous materials stored in them.
 - That these fume hoods must be cleaned of any obvious contamination.
2. The Department/Laboratory shall be given adequate notice time (non-emergency situation) to complete the above steps, and once completed, will promptly notify Trades/Utilities.
3. Once notified, Trades/Utilities will:
 - Ensure that the fume hood(s) are empty of all hazardous materials.
 - Isolate all storage cabinets which vent into the fume hood(s).
 - Place out-of-service sign(s) on highly visible areas of the fume hoods and storage cabinets, which will indicate that the hoods are being serviced, and are not to be used for work or storage.



4. Trades/Utilities will contact the Radiation Protection Service to request a review of the use of the fume hood(s) for radioactive materials and to request a risk assessment. If it is determined that there is a potential radiation exposure risk, the Radiation Protection Service will:
 - Monitor the fume hood(s) for radiation dose and contamination hazards; and
 - Provide a verbal report of the assessment results to Trades/Utilities, followed by a written report.
 - Work on the fume hood can start as soon as the Radiation Protection Service signs that the area is safe to work.
5. Utilities will allow the fume hood(s) to vent for at least 12 hours after they have been emptied.
6. After the allotted venting period and following clearance from the Radiation Protection Service, Trades/Utilities will
 - Stop the ventilation (mechanical or natural) through the fumehood.
 - Fully lower the fume hood sash
 - Seal off all fume hood openings with plastic and tape.
 - Apply all standard procedures for lockout/tagout of the system.
7. The internal surfaces of the fume hood system should be considered as potentially contaminated with chemical residue, and direct skin contact (e.g. with internal fume hood components) would be the main route of exposure. Workers conducting the maintenance work are to wear appropriate personal protective equipment to prevent skin contact, including:
 - Rubber gloves which provide adequate flexibility, physical resistance to tear, puncture and abrasion, and resistance to oil, grease and a broad range of organic chemicals (e.g. nitrile, neoprene, butyl rubber)
 - Chemical resistant clothing (e.g. Tyvek)
8. Given the 12-hour venting of the system, the shutdown of the fan, and a well- applied seal at fume hood openings, there should be minimal risk of inhalation of chemical contaminants. For added protection, workers conducting service/maintenance work may wear respiratory protection. As a minimum, this will consist of a NIOSH-approved air-purifying respirator (half or full facepiece) with a combination multi-purpose organic vapour/acid mist/formaldehyde/ammonia cartridge (e.g. olive North Defender Multi-Purpose cartridge) and HEPA cartridge (purple).
9. For work involving cutting, welding or otherwise heating ducts, the above suggested (s.8) respiratory protection must be used as the heat may turn oily materials into vapour, smoke or mist.
10. Trades/Utilities will carry out the maintenance work which will consist of the following steps:
 - a. Spread a plastic drop sheet under the work area.
 - b. Cut the vibration joints.
 - c. Bag the fan, and tape plastic over duct openings and all open ends.



- d. Remove the fan to an alternate location for decontamination.
 - e. Remove the drop sheet and HEPA vacuum the dust.
 - f. Install the rebuilt fan.
 - g. Remove the plastic from the duct openings.
 - h. Install new leak-tight vibration joints.
 - i. HEPA vacuum any dust under the work area.
 - j. Inspection to be conducted by Utilities engineer/leadhand.
11. Once the above service/maintenance work is completed, Trades/Utilities will remove the sealing applied to the fume hood(s) and/or storage equipment.
12. Utilities will start up the fan, and ensure that the following is conducted:
- Visual inspection of the physical condition of the fume hood(s) and components, and any storage equipment connected to the hoods
 - Face velocity testing
 - Inspection of the air flow indicator system.
13. Upon successfully completion of the inspections/testing listed in #11, Utilities/Trades will:
- Remove all out-of-service signage on the fume hood(s)/storage equipment.
 - Notify the Department/Laboratory that the fume hood(s) are ready to be used.

Note: Procedures for cleaning components of the fume hood system are separately covered.



Appendix A

Surface Contamination Tests for Perchlorates

Diphenylamine Test: Dissolve one gram of diphenylamine in 10 ml of "1 to 1" (18 normal) sulfuric acid to form a diphenylamine sulfate solution. Using a medicine dropper apply this solution to the test surface. The liquid turns black upon contact with perchlorate. The solution also reacts with nitrates, but turns blue.

Methylene Blue Test: Use 0.4% solution of methylene blue in water. Add a few drops of indicator solution to about 25 ml of trial solution, such as water used to test rinse from a length of potentially contaminated duct. Perchlorates will produce a violet precipitate.

Tests are from the Harvard Guidelines for use of Perchloric Acid accessed October 13th, 2009
<http://www-safety.deas.harvard.edu/advise/PerchloricAcid.html>