DALHOUSIE UNIVERSITY *Inspiring Minds*	*Policy Sponsor:* Assistant Vice President Facilities Management Signature:	*Approval Date:* May 23, 2018
Facilities Management Chemical Fume hood Maintenance / Impairment Procedure	*Responsible Unit:* FM Director of Operations Signature:	*Revisions:*

Contents

A. *Background and purpose*:

This procedure outlines the requirements necessary to perform routine or emergency maintenance / repairs to chemical fume hood exhaust systems at Dalhousie University. This procedure is designed to consider the health and safety of both the users of the chemical fume hoods as well as those that are performing the work.

B. *Application:* Applies to all Dalhousie University operations.

C. *Definitions:*

EHS: Environmental Health and Safety
SOP: Standard Operating Procedures
Fall Protection System: means any secondary system that is intended to prevent a person from falling or arrests a fall that occurs, and includes guardrails, temporary flooring, travel-restraint systems, personnel safety nets and fall-arrest systems
Lockout-tag out (LOTO) is a safety procedure which is used to ensure that dangerous machines are properly shut off and not able to be started up again prior to the completion of maintenance or servicing work. It requires that hazardous energy sources be "isolated and rendered inoperative" before work is started.

D. *Policy statement:* This policy establishes minimum safe work requirements for performing maintenance / repairs, which may impair the safe operation of chemical fume hoods in an effort to protect both the users of the units as well as those performing the maintenance / repair.

E. *Administrative structure:* The Assistant Vice President, Facilities Management, is the sponsor of the policy, with responsibility for implementation being provided through the Facilities Management staff.

This policy was written in conjunction with appropriate stakeholders and reviewed by the Facilities Management EHS committee.

F. *Procedures:*

1. *Risk consideration*

Prior to commencing any work that may impair the safe operation of a chemical fume hood or place employees in a location where they may be adversely affected from the potential contamination from the exhaust system, it is critical to consider and mitigate the associated risks.

Researchers and students rely on the proper operation of these devices to protect themselves, equally important, those performing maintenance on the systems are required to be informed and protected from chemical, biological and or radiological hazards that may be present.

Specific clearance is required in advance from the Dalhousie University Environmental Health and Safety Office before beginning any work with fume hoods identified as being used with perchloric acid or radioactive materials.

Some fume hoods on campus have interiors constructed with asbestos or may have exhaust duct insulation that may contain asbestos. Any work that may break the integrity of these asbestos containing surfaces requires assessment under Dalhousie Asbestos Management program.

2. *Hazard Assessment*

A site specific hazard assessment shall be conducted considering the following:

- Nature of the work to be performed
- Location of the work to be performed
- Roof access control
- Notification requirements
- Weather conditions
- Training required for the people involved
- Nature of potential contamination
- Clean up and decontamination process (equipment, tools, personnel)
- Determination of required control measures
- Access to medical response
- PPE required
- Fall protection systems requirements
- Lifting devices, rigging, hoists etc.
- Lockout / Tagout (LOTO) requirements

Completed assessments shall be reviewed and available for all personnel performing the work.

3. *Determination of affected Fume hoods*

Prior to beginning any work on chemical exhaust fan systems that may affect the safe operation of the connected fume hoods, a review shall be completed to verify the number and location(s) of all potentially affected fume hoods in that system.

4. *Notification to Fume Hood users*

Prior to beginning any routine work that may negatively impact the safe operation of fume hoods it is imperative that the users of the affected fume hoods receive advance notification. This notification it typically provided three days in advance through the Faculty Administrators.

In the case of an unplanned maintenance / emergency repair, where advance notification is not possible, efforts shall be taken as soon as possible to alert Faculty Administrator / hood users of the impairment.

5. *Securing chemical emissions*

In advance of the maintenance activity, it is required that any chemical reactions being performed in the affected fume hood(s) be suspended and that any chemicals located within the hood or its attached ventilated storage cabinets be secured to prevent any emissions including sealing, stoppering, capping or relocation as required.

When practical, the exhaust fans shall be left running for a 12 hour period once the chemicals in the fume hoods have been contained / removed to allow any residual chemicals in the exhaust system to dissipate, before work on the system commences.

6. *Warning signs to be posted*

It is required that each fume hood that is affected by the maintenance/ repair activity be identified with a prominent warning sign that indicates the following:

- A statement that the fume hood should not be used and is undergoing maintenance
- The date the warning sign was installed
- A contact number to call to request more information

7. *Physical securing the fume hood from accidental operation*

It is required that the sash of each affected fume hood be physically secured to prevent its accidental use. Typically this securing will involve the installation of a crimped loop of metal cable, however, it is also acceptable to secure the fume hood sash by other means as long as it restricts the sash opening and requires a distinct effort to defeat the securement.

8. *Training*

All individuals who are expected to work on the maintenance or repair of a fume hood exhaust systems shall be instructed in the following:

- Knowledge of the manufacturer's instructions pertaining to the assembly and disassembly of the unit
- Workplace Hazardous Materials Information Systems (WHMIS)
- Safe use of the required Personal Protective Equipment (PPE)
- Knowledge of emergency procedures in the event of an incident involving injury or damage to equipment
- Knowledge of the required decontamination procedures for personnel and equipment
- Fall protection and scaffolding (as required)
- Lock Out / Tag Out (as required)
- Hoists and rigging (as required)
- Confined space entry (as required)

9. *Emergency Plans*

Depending on the nature of the work being performed an emergency plan may be required to specify procedures for handling sudden or unexpected situations.

This plan shall identify the following:

- Identify evacuation routes, alternate means of escape, make these known to all staff and keep the routes unobstructed
- Specify safe locations for staff to gather for head counts to ensure that everyone has left the danger zone. Assign individuals to assist employees with disabilities
- Consider medical first aid response options
- Consider methods of communication and other notifications

10. *Performing the work*

Work shall be performed as per approved Preventative Maintenance document(s) or as per manufacturer specifications / recommendations.

Any deviations from these established procedures require pre-approval by the Facilities Management Zone Supervisor.

11. *Performing work on a Fume hood indicated for use with perchloric acid*

If a fume hood is indicated as being used with perchloric acid, clearance is required in advance from the Environmental Health and Safety Office. Special precautions may be necessary to mitigate the risk of explosion.

12. *Performing work on a Fume hood indicated for use with radioactive materials*

If a fume hood is indicated as being used for radioactive materials, clearance is required in advance by the Radiation Safety Manager from the Environmental Health and Safety Office. Special precautions including wipe tests to measure radiation and additional PPE may be required.

13. *Clean-up and Decontamination Process*

Decontamination is the process of removing or neutralizing contaminants that have accumulated on equipment or personnel.

Decontamination protects workers from hazardous substances that may contaminate protective clothing, respiratory protection equipment, tools, vehicles, and other equipment used on site; it protects all site personnel by minimizing the transfer of harmful materials into clean areas; it helps prevent mixing of incompatible chemicals; and it protects the community by preventing uncontrolled transportation of contaminants from the site.

Decontamination Plan

Depending on the scope of the work being performed a decontamination plan may be necessary and typically includes the following considerations:

- Determine appropriate decontamination methods
- Determine the decontamination equipment needed
- Determine the number and layout of decontamination stations
- Establish procedures to prevent contamination of clean areas
- Establish methods and procedures to minimize worker contact with contaminants during removal of personal protective clothing and equipment (PPE)
- Establish methods for disposing of clothing and equipment that are not completely decontaminated
- Identify where the workers can shower after the work is completed (if required)

Prevention of Contamination

Effort shall be made to minimize contamination, including the following;

- Employ work practices that minimize contact with hazardous substances (e.g., do not walk through areas of obvious contamination, do not directly touch potentially hazardous substances)
- Wear disposable outer garments and use disposable equipment where appropriate.
- Cover equipment and tools
- Encase the source of contaminants, e.g., plastic sheeting

Types of Contamination

Do to the nature of chemical fume hoods it should be anticipated that both external and internal components of the exhaust system may have come in contact with chemical, biological or radiological materials.

Decontamination Methods

All personnel, clothing, equipment, etc. leaving the contaminated area of a site shall be decontaminated, as necessary, to remove any harmful chemicals or other contaminates that may have adhered to them.

Decontamination methods include:

- physically remove contaminants
- inactivate contaminants by chemical neutralization /disinfection / sterilization
- remove contaminants by a combination of both physical and chemical means

In many cases, gross contamination can be removed by physical means involving dislodging/ displacement, rinsing, wiping off, and evaporation. Physical methods involving high pressure should be used with caution to avoid spreading contamination.

Physical removal of gross contamination may additionally require a wash/rinse process using water or cleaning solutions.

14. *Returning fume hoods back in service*

If the nature of the work performed may have affected the air flow in the fume hood (i.e. repairing / replacing fan or motor components, ductwork modifications, altering sheaves, etc.) then upon conclusion of the work, Facilities Management, shall verify the face velocity air flow at each affected unit using a portable anemometer as per the Dalhousie University policy on "*Annual Fume Hood Inspections*". If the face velocity is within acceptable range, Facilities Management shall remove the warning signs and locking cable placing the hood back in service.

Where the work performed was not anticipated to have impacted the air flow of the fume hood (i.e. changing light bulbs, repairing hinges, etc.) then this verification step may be omitted.

Should the face velocity air flow for a unit not be within the acceptable range the hood shall be identified as defective, the locking cable and warning label shall be reinstalled and the users notified. The fume hood shall not be returned to service until it meets the acceptable face velocity air flow requirements.

15. Warning sign example

Building/Room #_____

Fume Hood #_____ Fan # _____

Department _____

FUME HOOD NOT IN SERVICE

DO NOT USE

Date of shutdown: _____

Reason for shutdown: _____

For further information please call:

Facilities Management phone number: _____