University of Washington
Environmental Health and Safety

Safe Procedures for Fume Hood Maintenance and Repair

Policy

All employees who perform maintenance or repair work on fume hoods, fume hood fans and exhaust duct work, and on or near fume hood exhaust stacks must follow approved safety procedures and receive safety training appropriate to expected hazardous exposures.

Procedures

1. Verify Fume Hood Decontamination

   For scheduled maintenance work, the Physical Plant Supervisor, Lead, Planner/Coordinator, or Maintenance Coordinator responsible for the project shall require the laboratory personnel to complete the *Notice of Laboratory Equipment Decontamination* form (Form UoW 1803, attached). For non-scheduled maintenance work, the employee assigned to the job will provide the *Notice of Laboratory Equipment Decontamination* to the laboratory employee when they visit the laboratory. The form is also available from the Physical Plant order desk, from EH&S, and is in the Laboratory Safety Manual, Appendix E. To reinforce that fume hoods are to be cleaned prior to maintenance work, the Physical Plant order desk will mark all fume hood orders as safety hazards.

   The *Notice of Laboratory Equipment Decontamination* verifies that the inside of the fume hood has been cleaned by laboratory personnel. The form also provides the information the Supervisor or Lead and the employee(s) scheduled to do the work need to assess potential hazards from working in the fume hood system and to determine the level of personal protective equipment (PPE) and training that will be needed. Supervisors and Leads should contact EH&S at 3-7388 if they have any questions about hazards or PPE.

2. Complete Safety Hazard Review
   (Reference Facilities Services Safety Manual 93-2)

   Before scheduling a job or assigning work, Supervisors, Leads, Planner/Coordinators, or Maintenance Coordinators should review the job for potential hazards using the Safety Hazard Review Checklist and take appropriate preventive and/or corrective action.

3. Verify Removal of Hazardous Materials

For work inside fume hoods, employees must verify that the work area has been cleared of hazardous materials and washed. Laboratory employees are required to verify that the hazardous materials have been removed and the surfaces inside the hood washed by signing in the appropriate space on the *Notice of Laboratory Equipment Decontamination* and attaching the form to the fume hood.

4. Update Safety Training

Supervisors must assure that employees scheduled to work on fume hoods, fans and ducts have appropriate and up-to-date training in safe procedures for fume hood maintenance or repair, personal protective equipment, lock out and hazard communication. Other training may also be required depending on the circumstances and hazards involved.

5. Notification to Affected Departments

The responsible Physical Plant Maintenance Coordinator will notify the department that owns the hood or any hoods connected to the system that the system will be shut down by initiating the utility shutdown notification procedure established for the area. The notification must inform laboratory personnel that they cannot use the hood during the work. The laboratory must also take every container out of the hood(s) or cap them for the duration of the shutdown. If maintenance employees will be working in the hood itself, laboratory employees must take out all chemicals and other hazardous materials and equipment from inside the fume hood and wash the surfaces. Physical Plant employees must not work inside a hood with chemicals in it.

6. Special Considerations

Physical Plant Supervisors will keep a record of the fume hood maintenance or repair work on the *Fume Hood Maintenance/Repair Work Record* form (attached) if there are special concerns or problems with the work. This form will be kept with the other work order documentation as a record of compliance with health and safety requirements.

7. Lockout

On the day of the shutdown, employees performing the maintenance or repair should check the fume hoods to see that all containers in the hood are closed. Closed containers can remain inside the fume hood if the work to be performed is on the outside of the fume hood. Following the standard lockout procedure, lock off the fan and lock the sashes closed on all the fume hoods connected to the fan and duct work. The fan need not be shut down if the work is only inside the hood.

8. Wash Fume Hoods Prior to Beginning Work

Laboratory personnel will be instructed through procedures developed and distributed by EH&S (see Preparing Laboratory Equipment for Service or Disposal, attached) to wash the work area inside the hood before maintenance work begins.

If workers will be in contact with duct work and fans, these areas must also be cleaned prior to beginning work. The cleaning of duct work and fans must be done by a qualified contractor or qualified Physical Plant personnel. Removing the contamination from duct work and fans must be done in two steps: gentle washing and vigorous washing. Start the washing process from an existing access hole in the system, such as the hood, the exhaust stack or a hole previously drilled in the system. If there is no access hole near where you are going to do the work you will have to make one.

- ❑ Cutting Into Duct Work

  To make a new access hole in the system, cut the hole in a flex joint or an area of smooth duct away from any seams, preferably where the duct runs vertically to avoid possible accumulations of hazardous chemicals. Use a drill or a knife to cut a hole just big enough to insert a misting wand. Use the wand for 5-10 minutes to dissolve any perchlorate crystals (explosion hazard) from around the hole. Enlarge the hole as needed after the misting. Make sure you don't cut the hole beyond the area that has been misted. A large hole may have to be cut in several steps.

- ❑ Gentle Washing

  Gentle washing must always be done before working inside the system to remove the shock sensitive, but water soluble chemicals. You can do the gentle washing two different ways, with a light water mist or low pressure steam. Use a water mist to gently wash a part of the system, or wash the whole system at once with steam. Steam it from the fume hood for 24 hours with the fan running. Be aware though, if the system has leaks in it, such as from corrosion, the condensed steam

may leak out into pipe chases, inside walls and other areas. The leaks will contaminate these areas and they can be difficult to clean. Gentle washing must always be done before working inside the system.

- ❑ Vigorous Washing

Vigorous washing removes the remaining contaminants. Vigorous washing is done with a pressure washer or brushing with warm soapy water. You must use chemical protective clothing until you have finished the vigorous washing. Treat parts that haven't been vigorously washed as contaminated.

- ❑ Controlling/Cleaning Leaks

Find all the holes in the system where water can drain out. This includes the fume hood opening, the sink in the hood, HVAC monitoring holes, drain holes in the fan housing and pin holes from corrosion. Either seal the holes or put something under them to collect the water draining through them.

Lay a waterproof tarp under the leaks. Raise the edges by taping them up, laying them over something, or rolling them up. Do not allow water to stand on the tarp. Either use the tarp to direct the water to a container or drain, or clean it up as it collects. Use a mop or a wet/dry vacuum to remove standing water from the tarps. Remember, the mop and vacuum may be contaminated. It will not be necessary to use a special explosion proof vacuum since the liquid is mostly water.

Someone should be checking the outside of the system during the cleaning to make sure no leaks are over looked. If there are missed leaks, stop the washing and immediately wipe them up. Then rinse the areas where the leaks ran and collected and wipe them up.

When the washing is completed, roll the tarps up so the wet surface is inside. Put them and any other equipment/ tools that got contaminated during the washing in a water proof container. Clean up any areas outside the fume hood system that got wet during the washing the same way missed leaks are cleaned up. Take the equipment where it can be rinsed off. The water from this rinsing can go down the drain. The equipment can be treated as nonhazardous after this final rinse. Do not reuse the chemical protective clothing. Throw it away. Take a shower when you finish the work.

❑ Personal Protective Equipment for Washing Fume Hood Ducts

Since washing creates contaminated water splashes and mists, you will have to use personal protective equipment during the cleaning. Use a respirator, eye protection, waterproof rain gear, gloves and boots. Disposable equipment can be thrown out in the regular trash. It does not have to be treated as hazardous waste.

- Respirators

  Use a purple cartridge on your respirator during the cleaning. The purple cartridges are labeled "good for dusts, mists, fumes, asbestos and radionuclides." They will filter out any mists or splashes no matter what chemical is present.

- Eye Protection

  If you are using a full face respirator, you don't need additional eye protection. Otherwise use chemical splash goggles while cleaning the system.

- Rain Gear

  Use a coated Tyvek© or other waterproof disposable suit during the cleaning. It can be one piece coverall or a separate jacket and pants. If it is a two-piece outfit, do not tuck the jacket into the pants so any splashes will run off you.

- Gloves

  Use disposable nitrile gloves while cleaning. Use duct tape to seal between the rain gear and the gloves.

- Boots

  Wear waterproof boots or shoe covers. Keep the cuffs of the rain gear on the outside of the boots.

9. Wash Water

The wash water may be released into a drain to the sanitary sewer unless a material other than detergent has been added. If you have questions about disposal of wash water from cleaning a fume hood, contact EH&S Chemical Waste Group at 685-2848.

10. Old Leaks

Wash up old leaks in a fume hood system using the same procedure for washing the inside of the system, gentle washing followed by vigorous washing. If the leak is onto a porous surface, such as wood or sheetrock, it can't be entirely cleaned. The porous material may have to be disposed of as hazardous waste. Contact EH&S Chemical Waste at 685-2848 for disposal instructions. If there might be perchlorates in the contamination, keep the contaminated area wet as long as it is worked on.

11. Work on the Roof Near Fume Hood Exhaust Stacks

a. Eight Foot Stacks

No special procedures are required to work on roofs where the fume hood exhaust stacks are at least eight feet above the work area except to stay out of the airstream.

b. Shorter Stacks

If the exhaust stack is less than eight feet, work upwind of the stack or at least ten feet away from the stack. Report the location of short stacks to Senior Supervisors for inclusion on the safety projects list.

c. Horizontal Stacks

If the stack exhausts horizontally and the wind is blowing in the same direction as the stack discharge, work up wind of the stack. Otherwise, stay off the roof until wind conditions change.

12. Hazard Communication

Many different types of hazardous materials are used in fume hood systems. It is not possible to say specifically what was used in a particular system but the hazards can be controlled without knowing exactly what was used. The hazards can be broken into four basic types.

- ❑ Biohazards (Germs)
- ❑ Hazardous Chemicals (Poisons)
- ❑ Radioactive Chemicals
- ❑ Perchloric Acid (other potentially shock sensitive chemicals)

Biological agents (germs) that can cause disease are not supposed to be used in a standard fume hood. They should only be used in a biological safety cabinet. Even if they were released in a fume hood system the air blowing though the system would dry out and kill most germs.

Unfortunately, there is no way to test for every hazardous chemical that could be in a fume hood system. Asking the researchers what they have used in it might give you an idea of what is there. Of course, they can only tell you what they know about and remember. There is no way to find out what was used before they took over the lab. Luckily, hazardous chemicals cannot harm you if they do not get into or on you. It is quite possible to prevent that even if you don't know what the chemical is.

Most radioactive materials also cannot harm you if they do not get into or on you. The kind that can affect you at a distance is not used in fume hoods. It is possible to test for radioactive materials. Call Radiation Safety at 543-6328 to get testing done.

Chemicals that can leave a shock sensitive residue (like perchloric acid) are the most serious hazard you might encounter in fume hood systems. The primary hazard comes from the use of perchloric acid. This chemical reacts with other chemicals to form the shock sensitive perchlorates. Perchloric acid is usually used in special hoods that have a water spray built into them. The water is supposed to rinse any perchlorates out of the system. Some areas of the duct might be out of reach of the spray and some people may have used perchlorates in a standard hood. Perchlorate crystals dissolve easily in water so they are easy to wash off as long as they get wet. They will not explode when they are dissolved. Another problem can occur if the ducts are corroded. The wash water will leak out. When it dries, it leaves the perchlorates behind. This is particularly a problem when it leaks onto wood or other combustible material. Even a small amount can start a fire when struck or a spark lands on it. This happened in the Marine Sciences building many years ago.

It is better to prevent exposure to hazardous fume hood system materials than to treat the health problems they cause. This is true whether you know what the material is or not. This procedure is designed to prevent any and all exposures.

If it is not possible to follow these procedures contact EH&S at 543-7388 for assistance.

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University of Washington
Physical Plant Department

Fume Hood Maintenance/Repair Work Record

Building_____ Room Number_____

EH&S Fume Hood ID Number(s)_____

Work Order Numer_____

Scheduled Start Date: _____ Scheduled Completion Date: _____

Maintenance and Construction Coordinator: _____

Supervisor: _____

Physical Plant Personnel Working on System

Name	Shop #	Phone

Shutdown and lockout of system complete? [ ] No [ ] Yes (Attach lockout checklist if used)

Environmental Health and Safety comments: _____

EH&S representative: _____ Date: _____

To be completed by a Physical Plant Supervisor when fume hood work order involves special hazard considerations. Completed form to be filed with work order documentation.

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