Entry into Interior Spaces after Fire or Spill

1. Purpose / Background
MIT Environment, Health and Safety (EHS) personnel are often asked to provide approval for re-entry into an interior space after a fire or spill (chemical, radiological, biological) has occurred. This Standard Operating Procedure (SOP) is intended to provide clear procedures by which EHS personnel can make decisions related to reoccupying a space affected by a fire or spill.

Because the conditions produced by a fire are often different from those produced by a chemical, radiological, or biological spill, this SOP is divided into two sections addressing each of these topics. If both a fire and a spill occur in the same space at approximately the same time, then EHS personnel should follow both portions of the SOP.

2. Scope
This SOP is intended to guide decisions made by EHS personnel and to provide information to MIT community members on the decision-making process used to determine when an interior space is suitable for reoccupation after a fire or spill has occurred.

Take note, however, that not all decisions that encompass the final determination of interior space reoccupation suitability after a fire are made by EHS personnel. It may be necessary to consult outside experts or other MIT personnel to make some pertinent decisions before space reoccupation after a fire. Some of these topics on which outside experts/other MIT personnel may need to be consulted are listed in Appendix A.

3. Prerequisites
N/A

4. Procedures
Note that re-entry of a building or interior space after a fire or spill may need to be accomplished in a gradual or phased fashion. The decision to re-occupy a building or space in a phased manner will be made by the Cambridge Fire Department (CFD) incident commander (“white hat”), the MIT Emergency Response Team (ERT) incident commander, and/or the EHS representative at the scene.

a. Re-entry of a Space after Fire
- Above all, if the CFD has reported to the scene, do not enter the space until
  i. The CFD incident commander has given the “all clear”; or
  ii. The CFD has given the ERT incident commander permission to take over the site.
    Once the ERT incident commander has gained control of the site from the CFD, he/she will provide the “all clear” when the building is safe to enter.

Generally, it is often helpful for EHS responders to introduce themselves to the incident commander(s) once on-scene so he/she can use you as a resource if necessary.

- First, assess the severity of fire-induced damage. Some the activities listed below may not need to be performed if the fire was minor and localized.
Secondly, determine if the fire involved any radioactive materials, biological materials, or chemicals. If it did, follow the procedures for a radioactive, biological, and/or chemical spill (Section 4b) in addition to the procedures listed in this section.

Next, determine if the air quality within the space needs to be evaluated. The Industrial Hygiene Program (IHP) within EHS has the expertise and experience to make this determination. IHP will also perform an air quality assessment at the request of the CFD, the MIT Department of Facilities (Facilities), or space occupants.

IHP has access to the necessary equipment to perform an air quality assessment. Common parameters that are evaluated after a fire include carbon monoxide and particulate. If the fire impacted building materials, IHP may need to evaluate other constituents (i.e., asbestos, formaldehyde, polychlorinated biphenyls [PCBs], volatile organic compounds [VOCs]).

If the fire was widespread or especially smoky, contact a member of IHP to determine if an inspection of heating, ventilation, and air conditioning (HVAC) ducts/diffusers for soot is required. Similarly, an inspection of water heaters or furnaces may need to be performed to ensure that these pieces of equipment are sufficiently operational. IHP, with assistance from Facilities, can perform these inspections.

If the fire took place within a laboratory fume hood, glove box, biosafety cabinet, or other ventilated enclosure, thoroughly inspect the equipment and associated ductwork for damage. Contact a member of IHP for assistance with this. Inform laboratory occupants that the equipment cannot be used until an IHP representative inspects it. IHP personnel may need to consult with a representative from the equipment manufacturer to ensure that all portions of the equipment remain in good working order. If the equipment contains any filters (e.g., HEPA filters in biosafety cabinets), IHP personnel should ensure that the filter is not clogged with soot or otherwise damaged. For biosafety cabinets, recertification according to NSF/ANSI Standard 49 may be necessary. EHS may need to consult with B&V Testing, Inc. to make this determination.

Contact the Fire Protection Supervisor within Facilities to ensure that all fire/smoke alarms and fire suppression systems are reset and functioning properly.

Inspect all electronic equipment located in the vicinity of the fire for integrity. Check all cords, cables, strips, outlets, electronics, and telecommunication equipment to ensure that there is no danger of exposure to electricity. EHS’ Safety Program can assist with this task.

If lighting within the space has been diminished, IHP can use a special instrument to determine if illumination is adequate.

If the fire was located in or near a food service area or if the fire was widespread and impacted a food service area, ensure that foodstuffs present in the area during the fire are discarded.

Examine all fire extinguishers within the space to ensure that they are in place, fully charged, and free from damage. Contact the Fire Protection Supervisor within Facilities to arrange for this examination.
If debris remains within the space, the occupants of the space should arrange for a clean-up:

- If any hazardous materials were involved in the fire, if soot is pervasive in the area, and/or if the debris consists of hazardous building materials (i.e., asbestos, lead, PCBs), an outside clean-up contractor will need to perform the clean-up. A member of the Environmental Management Program (EMP) or IHP can arrange for this specialized clean-up and/or determine if it is required.

- If no hazardous materials were involved in the fire and if no hazardous building materials are components of the debris to be removed, the space occupants can contact Custodial Services (cust-coach@mit.edu) to arrange for cleaning. A member of IHP should also contact Custodial Services to inform them that the debris is safe to be cleaned using standard methods.

b. Re-Entry of a Space after a Spill

Please note that if the CFD is on-scene, re-entry of spaces after a spill can only occur with CFD oversight and approval. If the ERT is on-scene and has control of the site, re-entry of spaces can only occur after consultation with the ERT incident commander.

1. Chemical Spill

   - Note that additional information on chemical spill response procedures can be obtained in the EHS SOP entitled “Spill and Release Response Procedures” (EHS-0004).

   - Once EHS is aware that a chemical spill has occurred, both an IHP and EMP representative should be consulted for space re-entry and spill clean-up/reporting purposes, respectively.

   - Determine the following through conversations with personnel who occupy the space or other individuals involved in the spill(s):
     - Chemical(s) involved
     - Quantity and physical state(s)
     - Location(s) of the spill(s)
     - Location(s) and type(s) of exhaust system(s) within the space
     - Any activities already performed to contain, clean, and/or dispose spill(s)

   - Obtain a Material Safety Data Sheet (MSDS) and physical data for the chemical(s) involved. Physical data that is of particular interest includes vapor pressure, vapor density, and explosive limits. If the CFD is on-scene, the EHS responder, with help from lab occupants, must provide copies of MSDSs to the CFD incident commander as soon as possible.

   - Contact a member of IHP to monitor air quality within the space before entering if you determine that the atmosphere may be hazardous based on the information you collected about the spill(s) and chemical(s). If you cannot make this determination independently, consult with a member of IHP.
• To monitor air quality within the space remotely, IHP will most likely use tubing with direct reading instruments. The instrument used to monitor the atmosphere will depend on contaminants suspected to be present in the space. Instruments commonly used for this purpose include a photoionization detector (PID), a four gas meter, an infrared analyzer, and/or a TLD-1. When using tubing with these instruments, keep in mind that the response times of the instruments may be delayed since it will take some time for air from the space of interest to reach the sensors.

• The space can be entered if:
  • A member of IHP determines that the atmosphere is safe based on information regarding the spill and the chemicals involved and/or professional judgment
  • Concentrations are less than available and current American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) or other appropriate and applicable occupational exposure limits (OELs)
  • The concentration of total volatile organic compounds is below 5 ppm (if no OELs are available)
  • The atmosphere contains less than 10% of the lower explosive limit (LEL) of the airborne constituents
  • The atmosphere contains between 19.5% and 23.5% oxygen

• If the above conditions are not satisfied, the space cannot be entered without the use of a supplied air respirator. Use of a supplied air respirator requires a medical examination, a respirator fit test, and specialized training. Only select EHS personnel are qualified to use this equipment. Keep the space isolated, wait for several hours, and take readings again before attempting to enter the space without respiratory protection.

• An EMP staff representative will determine if the release must be reported to governmental environmental agencies and perform any notification required. In some circumstances, agencies need to be notified within two hours of the release. Therefore, consult an EMP representative early in the assessment stage.

2. Biological Spill
• Biological spills are generally handled differently based on the subject biological agent. Different responses to spills have been developed by the Biosafety Program (BSP) for BL1/BL2 labs and BL2+/BL3 labs. These response procedures are outlined in the MIT Emergency Response Guide “flip-chart”.

• For most BL1 and BL2 spills, lab personnel have the necessary training to handle clean-up. For all BL2+ and BL3 spill events, the BSP should be notified and consulted. The information contained in this SOP is very general – the BSP will provide crucial expertise and detail for particular spill conditions.

• The BSP must be notified immediately when a BL2+ or BL3 spill has occurred. The BSP must be notified of a BL2 or rDNA spill after it has occurred and been cleaned by...
laboratory personnel. The BSP does not need to be notified of a BL1 spill (unless it involves rDNA).

- For BL1/BL2 labs, entry into the laboratory after a spill can generally happen immediately.
  - If the spill is still present and not properly cleaned and decontaminated, those entering the laboratory must be trained by the BSP and need to wear appropriate personal protective equipment (PPE) which typically consists of a laboratory coat, gloves, and a faceshield.
  - If the spill has already been cleaned and decontaminated, the laboratory is safe to enter without any PPE.
- For BL2+/BL3 laboratories, the space cannot be re-entered until at least 30 minutes after the spill has occurred.
  - All BL2+ and BL3 laboratories at MIT have an individualized written procedure on how to respond to spills that is kept in a Laboratory-Specific Biosafety Manual kept on-site at each laboratory. It is the responsibility of the laboratory occupants to clean and decontaminate spills. Once a spill has been cleaned and decontaminated, the laboratory can be reoccupied.

3. Radiological Spill
MIT license conditions and Massachusetts Department of Public Health (MDPH) regulations require that radiological contamination as a result of a spill or accident be cleaned to below certain levels. Radiation Protection Program (RPP) staff will perform the appropriate surveys and testing to determine when the lab/space is suitable for re-entry. If a spill of radioactive material or a fire involving radioactive material requires evacuation of a laboratory or space, re-entry into the space should not occur unless a complete evaluation of the area has been conducted by the RPP. After the RPP clears the space, it may be reoccupied if all other previously noted conditions are satisfied.

5. Roles and/or Responsibilities
**Cambridge Fire Department** – the CFD may report to the scene of a fire or spill at MIT. If the CFD responds to a spill, the specialized CFD Hazmat Team may be called to the site depending on the severity of the spill or the nature of the material spilled. The CFD Hazmat Team will typically enter a space after a chemical, biological, and/or radiological spill has occurred (after making a decision about the level of personal protection required). Conversely, the general CFD will not typically enter the space unless the on-site CFD incident commander determines that it is safe from them to do so. When on-scene, the CFD incident commander provides the ultimate “all clear” to indicate that the space may be reoccupied after a fire. Sometimes their decision to provide the “all clear” is guided by information provided by MIT EHS personnel.

**Industrial Hygiene Program** – the IHP (within EHS) has the equipment and expertise to evaluate air quality within a space after a fire or chemical spill has occurred. Additionally, IHP can evaluate the presence of hazardous building materials (asbestos, lead, PCBs) within a space as necessary. IHP also inspects and approves ventilated equipment (fume hoods, glove boxes, biosafety cabinets, other
enclosures) for use after it was impacted by a fire. Finally, IHP can conduct an assessment for adequate illumination.

**Department of Facilities** – Facilities is critical in inspecting spaces after a fire has occurred. Elements of a space that Facilities may need to inspect/test include structural integrity, HVAC systems, water heaters, furnaces, fire/smoke detectors, fire extinguishers, wiring, electrical equipment, sanitation systems, and emergency lighting.

**Safety Program** – the Safety Program (within EHS) should be consulted for inspection of electrical equipment that was impacted by or in the vicinity of fire.

**Outside Clean-Up Contractor** – If a fire involves a hazardous material, if debris from a fire consists of hazardous building materials, and/or if a chemical spill cannot be cleaned by MIT personnel, an outside clean-up contractor will be hired to clean the space. The cost of the clean-up is borne by the Principle Investigator (PI) or the Department, Lab, or Center (DLC).

**MIT Insurance Office** – If property damage occurred due to a fire or spill, the PI or DLC can contact the MIT Insurance Office to make a claim (http://controllers.mit.edu/insurance).

**Principle Investigator** – The PI is responsible for providing information about the fire/spill to CFD, ERT, and/or EHS. The PI can also assign a lab representative to provide necessary information to CFD, ERT, and/or EHS. Finally, the PI (or the DLC) is responsible for paying any outside clean-up contractors that is hired to manage a spill and for contacting the MIT Insurance Office when a claim is necessary.

**Department, Lab, or Center** – The DLC (or PI) is responsible for paying any outside clean-up contractors that is hired to manage a spill and for contacting the MIT Insurance Office when a claim is necessary.

**Custodial Services** – Custodial Services can handle cleaning spaces after a fire has occurred if no hazardous materials were involved (including building materials) and if soot within the space is not pervasive.

**Biosafety Program** – The BSP (within EHS) will provide expertise in determining when a space can be reoccupied after a biological spill.

**Radiation Protection Program** – The RPP (within EHS) will perform the necessary radiation survey/testing after a radiological spill to determine if and when a space can be reoccupied.

**Environmental Management Program** – The EMP (within EHS) is responsible for making decisions regarding the clean-up and reporting of chemical spills and the disposal of hazardous or potentially hazardous materials.

**MIT Emergency Response Team** – The ERT arrive on the scene of emergencies to assist the CFD in determining initiating causes, causal affects and resources necessary to resolve the incident.

**MIT Emergency Response Team Incident Commander** – The ERT incident commander is designated to be in charge of the ERT at the scene of any incident at MIT.
6. **Training**

Specialized training is required before using any form of respiratory protection. Members of IHP can perform or arrange for this training upon request.

The BSP provides training for laboratory personnel who work with biological agents. The training, entitled General Biosafety Training, covers cleaning and decontaminating biological spills and other related topics. It is administered as a classroom training within the EHS Office. Individuals can register for this training through the training needs assessment (TNA).

Cleanup of chemical spills larger than incidental spills requires specialized training (HAZWOPER). MIT EHS staff members generally have not completed this training. Therefore, outside clean-up companies will typically be consulted to perform this type of spill management.

7. **Record Management**

All records and documents must be retained and managed in accordance to the EHS' Records Retention SOP. The following is a summary of record retention protocols that may be applicable to this SOP:

- All records that document employee and contractor exposure(s) to hazardous and toxic substances (this includes both personal and area samples) need to be kept permanently by the EHS Office.
  - All exposure monitoring results must be entered into the Exposure Database (I:\Air & Wipe Sampling\Air and Wipe Sampling Database Current.xls). Additionally, any reports or correspondence related to these results must be stored electronically at I:\Air & Wipe Sampling\Reports.

- All records related to monitoring of employee exposure to radiation on the MIT Campus and radiation surveys of MIT spaces must be kept permanently by the EHS Office.

- Any environmental samples taken to characterize a spill must be documented and records pertaining to these samples must be kept by the EHS Office for ten years.

- Records relating to indoor air quality testing must be kept for ten years by the EHS Office.

- All documentation relating to a health and safety incident (such as a spill or fire) that took place on the MIT campus must be kept permanently by the EHS Office. Additionally, information regarding these incidents must be entered into the electronic Incidents Database.

- Records that document the treatment and disposal of hazardous waste must also be kept permanently by the EHS Office; for non-hazardous waste, the record retention period is three years.

8. **References**

8.1. **Other SOP/ SOGs**

MIT EHS SOP EHS-0053, *Control and Reporting of Fires* (cited 11 April 08).


APPENDIX A
Non-EHS Issues That Need to be Addressed After a Fire

After a fire has occurred within an interior space, there may be several non-EHS items that need to be evaluated before reoccupation of the space can occur. EHS personnel do not have the expertise and/or authority to evaluate these items. Outside experts, however, can be consulted to make determinations on these topics.

- If property damage occurred as a result of a fire, the PI or DLC may opt to contact the MIT Insurance Office to make a claim (http://controllers.mit.edu/insurance).

- Determine if the fire involved structural elements of the building. If so or if you are unsure, contact a qualified structural engineer to assess the integrity of the space.

- Ensure that ceiling or wall materials are in tact and not in danger of falling. Examine interior and exterior windows and glass structures for cracks or breaks. If the fire affected the exterior of the building, determine if any exterior materials are in danger of falling.

- Arrange to have all wiring in the vicinity of the fire examined to ensure that there is no water damage from fire fighting or precipitation. Also, wiring should be inspected if it was impacted by the fire itself or if the fire was electrical in nature.

- Depending on the severity of the fire, test sanitation systems to ensure that they are functioning properly.

- If furniture was impacted by the fire, check it for stability. Ensure that it can support the weight it is intended to support. Also make sure that it is level.

- Ensure that the impacted space has adequate lighting and that emergency lighting still functions.

- If the fire was located in or near a food service area or if the fire was widespread and impacted a food service area, arrange for an inspection of all food service ventilation equipment to ensure that it is operating properly and that there is no clogging.
APPENDIX B

General Clean-Up Procedures for a Discharged Fire Extinguisher

If a fire extinguisher has been discharged, the contents can typically be collected and disposed by the laboratory group that used the extinguisher. Before attempting to handle or clean the discharged contents of a fire extinguisher, review the Material Safety Data Sheet (MSDS) to ensure that the material is handled appropriately. Very general information regarding these materials and suggested guidelines for clean-up of the extinguishing media is presented below:

- **Dry Chemical/Dry Powder** – Many fire extinguishers contain a dry chemical or dry powder agent (common agents are monoammonium phosphate, sodium bicarbonate/calcium carbonate, potassium bicarbonate/calcium carbonate, or sodium chloride).

  Typically, these agents are safe to handle and should be regarded as nuisance dust. As with any dust, exposure to these materials may cause respiratory, skin, and eye irritation. Exposure to the contents of these extinguishers may temporarily exacerbate preexisting respiratory conditions (e.g., asthma).

  Although respiratory protection is not typically required when handling these materials, individuals may elect to wear a filtering facepiece (“dust mask”). The EHS Office can issue filtering facepieces to persons who desire to use them. At the time of issuance, individuals electing to wear these filtering facepieces need to complete and sign IHP’s “Form for Voluntary Respirator Use” (see IHP’s Respiratory Protection Program Manager for more information).

  As when handling the clean-up of any chemical agent, chemically protective gloves and safety glasses should be worn.

  Typically, the contents of a dry chemical or dry powder fire extinguisher can be disposed as regular waste. The EMP can verify this on a case-by-case basis.

- **Halon/Clean Agent** – There are no known Halon or Clean Agent fire extinguishers at MIT and they are not currently used by the CFD.

  It should be noted, however, that Halon/Clean Agent extinguishers contain gases that can potentially act as asphyxiants in high concentrations (e.g., displace oxygen). The gases contained within these types of fire extinguishers can also potentially cause adverse health effects. An IHP staff member can assist in evaluating the air quality within a space where one of these fire extinguishers has been discharged.

- **Water** - if the fire extinguisher contained water as an extinguishing agent, it is generally safe for lab or EHS personnel to handle the clean-up. Respiratory protection is generally not required. Although exposure to the water extinguishing agent does not dictate the use of chemically protective gloves or safety goggles, these items should be worn due to the possibility that the water may have mixed with other materials during fire-fighting. Consult a member of EMP to determine how water from a fire extinguisher mixed with other materials should be disposed.
- Carbon Dioxide – Carbon dioxide fire extinguishers contain a carbon dioxide gas that extinguishes fires without leaving behind any residue. Therefore, carbon dioxide extinguishers generally do not require clean-up after they have been discharged.

It should be noted, however, that carbon dioxide extinguishers contain a gas that can potentially act as an asphyxiant in high concentrations (e.g., displace oxygen). An IHP staff member can assist in evaluating the air quality within a space where one of these fire extinguishers has been discharged.

- Foam – if the fire extinguisher contained a foam extinguishing agent, it is generally safe for lab or EHS personnel to handle the clean-up. Respiratory protection is generally not required. Chemically protective gloves, clothing that will minimize skin contact, and safety goggles need to be used during clean-up. Consult a member of EMP to determine how discharged foam from an extinguisher should be disposed.

- Wet Chemical – if the fire extinguisher contained a wet chemical agent (often potassium acetate), it is generally safe for lab or EHS personnel to handle the clean-up. Respiratory protection is not required unless the material is misting. Chemically protective gloves, clothing that will minimize skin contact, and safety goggles need to be used during clean-up. Consult a member of EMP to determine how a discharged wet chemical agent from an extinguisher should be disposed.