

Indoor Air Quality Program

1. Purpose

Temple University Environmental Health and Radiation Safety (EHRS) has developed this program to establish proactive, investigative, and remedial actions to be used in the management of indoor air quality (IAQ) concerns at Temple University.

2. Scope

This program applies to all university indoor work environments.

3. Responsibilities

3.1 Departments/Supervisors are responsible for:

- Notifying EHRS when employees have health concerns or symptoms related to the indoor work environment.
- Implementing remedial recommendations.
- Providing accommodations as necessary.
- Sharing results of IAQ investigations with affected staff.

3.2 Employees are responsible for:

- Reporting IAQ concerns to their supervisor, EHRS, or Facilities Management.
- Reporting health concerns related to their work environment to Employee Health Services.

3.3 Employee Health Services is responsible for:

- Providing a medical evaluation of employees who have health concerns related to their indoor work environment.
- Contacting EHRS for assistance with IAQ concerns as needed.
- Determining if medical accommodations are necessary and making those recommendations to the employee, supervisor, and EHRS.

3.4 Facilities Management is responsible for:

- Contacting EHRS for assistance with IAQ concerns as needed.
- Providing response to IAQ concerns in conjunction with EHRS and/or Housekeeping and assisting with any remedial action, if necessary.
- Determining if accommodations are necessary and making those recommendations to the employee, supervisor, and EHRS.
- Utilizing preventative maintenance practices to keep spaces clean and dry, with the correct amount of fresh air, humidity and temperature in maintaining comfort and air quality.

- Notifying potentially impacted building occupants of building maintenance projects that may contribute to IAQ concerns.
- Coordinating painting and/or remodeling projects to minimize impact on IAQ, when feasible.
- Conducting routine inspections and maintenance of HVAC systems and retaining records of such activity.

3.5 Housekeeping is responsible for:

- Contacting EHRS for assistance with IAQ concerns as needed.
- Providing response to IAQ concerns in conjunction with EHRS and/or Facilities Management and assisting with any remedial action, if necessary.
- Utilizing preventative maintenance practices to keep spaces clean and dry.
- Providing water extraction and drying services during water intrusion and flooding events.
- Following Housekeeping guidelines for remediation of water-damaged and mold-contaminated materials.

3.6 Project Delivery Group is responsible for:

- Coordinating plan reviews with EHRS in the design of new and retrofitted HVAC systems.
- Notifying potentially impacted building occupants of building construction/renovation projects that may contribute to indoor air quality concerns.
- Confirming that all new and remodeled locations are provided with adequate ventilation based on appropriate building code requirements.

3.7.1 Campus Safety Services is responsible for:

- Contacting EHRS after receiving a call regarding health and/or safety concerns as it relates IAQ.

3.8 Environmental Health & Radiation Safety is responsible for:

- Developing and maintaining the IAQ program.
- Conducting IAQ investigations when there are reported building occupant health concerns and/or symptoms related to the indoor work environment.
- Conducting monitoring for IAQ parameters and mold (see Appendix C) as necessary according to environmental conditions.
- Collaborating with Facilities Management, Housekeeping and/or Project Delivery Group in the remediation of IAQ concerns.
- Documenting and reporting findings of the investigation results to affected building occupants.

4. Program Elements

4.1 Reporting Procedures

IAQ concerns should be reported according to the following procedures:

4.1.1 Immediate Issues

Any IAQ concern that poses an immediate danger to life and health should be reported to Campus Safety Services.

4.1.2 Comfort Issues

Contact Facilities Management for concerns related to:

- Temperature or humidity;
- Air movement or drafts;
- Stale air;
- Particulates or dirt coming from the air handler vents or diffusers; and
- Mold odor or visible mold

4.1.3 Health Concerns and Symptoms

Employees who have health related symptoms that they believe are related to the indoor work environment, such as headaches, nausea, dizziness, upper respiratory irritation, chest-tightness, dry/sore throat, fatigue, itching/irritated eyes, runny nose, congestion, or shortness of breath should report the concerns to their supervisor, report to Employee Health Services for a medical evaluation, and contact EHRS. Upon notification, EHRS will schedule an assessment of the work area.

4.1.4 Odor Complaints

Contact Facilities Management for odors associated with sewer, fishy, or musty smells. Contact EHRS for unusual or abnormal odors that cannot be identified by Facilities Management. If the source of the odor is potentially hazardous to workers in the area (e.g. natural gas), contact Campus Safety Services immediately.

4.1.5 Mold

Contact Facilities Management if there is visible mold growth or mold odors associated with a recent moisture/leakage/flood event or air conditioning system. EHRS will investigate and make recommendations for remedial actions in those cases where Facilities Management is unable to address the concern. Contact EHRS when there is a

concern of mold or potential mold in the work area with no obvious mold source being apparent.

4.2 Investigation Procedures

When notified and if necessary, EHRS will perform an initial IAQ investigation using the following steps:

- Interviewing employees with concerns and other building occupants in the immediate area of concern;
- Conducting a walk-through inspection of the building or area of concern, in coordination with appropriate departments (e.g. Facilities Management, Housekeeping);
- Inspecting the building ventilation system with Facilities Management; and
- Conducting air monitoring for IAQ parameters such as temperature, relative humidity, carbon dioxide, carbon monoxide, volatile organic compounds, relative moisture content, and particulates.
 - Additional monitoring for bioaerosols (mold) and chemical contaminants may be necessary, at the discretion of EHRS, to provide more detailed information on the nature of the IAQ concern.

4.3 Reports

EHRS will prepare written findings of investigation results, including conclusions regarding possible causes of the IAQ concern and remedial actions. Copies of the IAQ investigation findings will be forwarded to the complainant, his or her supervisor, and other appropriate departments.

4.4 Remedial Actions

When necessary, EHRS will recommend remedial action. For example, when visual observations find significant mold in water-damaged environments, controlling and eliminating mold growth will be recommended in accordance with mold remediation guidelines (see Appendix C). When the source of an IAQ concern and appropriate remedial actions are unknown or difficult to determine, recommendations will rely on the judgement of EHRS, Facilities Management, and other appropriate departments in determining a causative relationship with the symptoms. EHRS will conduct a follow-up investigation to ensure remedial actions have been implemented and are effective.

4.5 Recordkeeping

EHRS will document and maintain all IAQ investigation findings, including reports, sample results, and correspondence.

5. References

- American Industrial Hygiene Association (AIHA) [Improving Indoor Air Quality at Work](#)
- Environmental Protection Agency (EPA) [Building Air Quality Guide: A Guide for Building Owners and Facility Managers](#)
- Occupation Safety and Health Administration (OSHA) [Indoor Air Quality](#)

APPENDIX A: Glossary

EPA: Environmental Protection Agency

HVAC: Heating, Ventilation, Air-conditioning

Indoor Air Quality (IAQ): Describes how indoor air can affect a person's health, comfort, and ability to work. IAQ can include temperature, humidity, insufficient outside air, insufficient air movement, airborne particulates, mold from water damage, and odors.

NIOSH: National Institute for Occupational Safety and Health

OSHA: Occupational Safety and Health Administration

Remedial Actions: Remedial actions may be confined and temporary, or as extensive as renovation of a building's HVAC system. Less extensive remedial actions include better housekeeping, replacing furniture, cleaning mildew off of pipes, installing portable dehumidifiers or air cleaners, cleaning window air conditioners, and replacing carpet with vinyl tile flooring.

APPENDIX B: Sources of IAQ Concerns

Chemical Agents

A. Sources

Chemicals may be introduced into the indoor environment in a variety of ways. Some examples are: volatile organic compounds (VOCs) found in newer office furniture and carpet, entrapment of an outdoor source via the HVAC system, and an indoor chemical release. Common contaminants are listed in Table 1. With the exception of chemical spills, exposures in office settings are far below enforceable concentration limits set forth by OSHA. However, small concentrations may provoke reactions in hypersensitive individuals.

Table 1

Contaminant	Health Effects	Example of Sources
Carbon Monoxide	Nausea, headaches, fatigue, drowsiness	Automobile exhaust, improperly vented stoves, hot water heaters, and furnaces
Carbon Dioxide	Fatigue, malaise, shortness of breath	Poor HVAC operation
Organic Vapors	Upper respiratory irritation, fatigue, nausea	Paints, solvents, disinfectants
Dusts	Upper respiratory irritation, dry throat, rhinitis	Various
Biological Agents- fungi, bacteria	Hypersensitivity pneumonitis, chronic rhinitis, common respiratory ailments	Various
Ozone	Upper respiratory irritation, dry eyes	Copiers, laser printers, air ionizers
Formaldehyde	Mucous membrane irritation, fatigue, skin rash	Particle board, plywood, adhesives in office furniture, tobacco smoke

B. Remedial Action

Remedial action for chemical agents may include substitution for a less hazardous product and source removal. Common office products may be substituted for water-based or low emission products. For example, using water-based interior paints that emit very low VOCs.

Biological Agents

A. Sources

Biological agents can create a complex mixture of indoor air pollutants. Sources range from human sneezes to spores generated from active fungal colonies. The scope of biological agents includes: viruses, bacteria, fungi, protozoa, arthropods, and mammals. Common indoor biological agents are known to cause four types of human reaction: infections, where living organisms penetrate and grow in human tissue (e.g., Legionnaires' disease); allergic or hypersensitivity diseases (e.g., hay fever, asthma); toxicoses (e.g., endotoxins) and irritant effects from compounds released from biological growth.

B. Remedial Action

Humid environments and condensation support the growth of biological agents. Therefore materials subjected to floods or leaks shall be removed or disinfected as soon as possible. Water extraction and drying shall begin as soon as possible after a flooding event. The air handlers will be inspected for biological growth by Facilities Management on a regular basis or as changes in condition occur.

Environmental Agents

A. Sources

Environmental agents such as humidity, noise, vibration and temperature play small but important roles in IAQ. For example, dry environments exacerbate respiratory ailments and cause eye irritation, nosebleeds and dry throat. Exposure to mechanical vibration will lead to headaches and fatigue. While rare in office environments, excessive noise exposures are related to hearing loss, headache and mental fatigue.

B. Remedial Action

Mitigating these sources is perhaps the easiest of IAQ issues. Since these issues are usually rooted in the building's mechanical system, identification and correction of the problems are straightforward and may involve removal or isolation of the source.

Odors and Acute Unsatisfactory Conditions

A. Odors

Odors are caused by a source significant enough to briefly overwhelm a building's HVAC system. In some cases, odors are related to maintenance or construction activities. Since the sources vary and are seldom persistent, the main focus of an EHRS investigation will be on unusual events or new sources that have been introduced into the building. Odors are commonly associated to singular events and require the exhausting capabilities of the HVAC system to perform properly. In most cases, the normal exhaust capability of the HVAC system has dissipated the odor before an investigation could be performed by EHRS. However, this will not prevent EHRS from conducting investigations. Once a source is determined, several departments may be called upon to remove the source.

B. Acute Unsatisfactory Conditions

Acute unsatisfactory conditions usually diminish over a short period of time and may stem from sources such as new office furniture, new carpets, or other recently manufactured equipment introduced into a structure. Materials used to manufacture these products may contain numerous VOCs that produce the effects listed in Table 1 upon mild exposure. These complaints should be forwarded to EHRS.

Chronic Unsatisfactory Conditions

Chronic unsatisfactory conditions are caused by a persistent source present in the building which doesn't diminish over time.

A. Sources

Sources which cause chronic mild symptoms related to the occupancy of a building are far more difficult to assess and require a complex investigative approach. EHRS's response to complaints of this nature will include a visual inspection of the building and HVAC system. If this inspection does not yield obvious sources, a systematic evaluation of the indoor environment will be undertaken, which may include collecting indoor air samples for biological or chemical analyses.

As of the date of this program, neither OSHA nor the EPA has developed standards which describe acceptable levels of airborne bioaerosols. In lieu of this, EHRS considers several factors when determining if levels of bioaerosols in indoor work environments could be of concern. These factors include comparing the abundance and type of indoor microbiological growth to outdoor levels.

Through real-time monitoring or OSHA/NIOSH sampling techniques, the identification and concentration of contaminants are determined. If sampling or monitoring results indicate contaminant concentrations exceed their respective exposure limits, the contaminant source shall be removed from the affected area if possible. If the source cannot be removed, efforts to contain or isolate the source will be undertaken. In addition to biological and chemical assessments, physical assessments will also be conducted. Monitoring of temperature and humidity will round out the systemic approach to solving an IAQ issue.

APPENDIX C: Mold Investigation Guidelines

The investigation and removal of mold in the workplace needs to be conducted in a thorough and consistent manner to avoid releasing mold spores into an occupied environment. Mold has been identified as a source of indoor air pollution and a health risk to susceptible individuals (e.g. immunocompromised). Health effects range from mild irritation to severe illnesses such as asthma attacks or fungal infections. The actual effects are based on many factors, such as: the type of mold, amount of mold contamination, accessibility of the mold to air currents and the human population, and sensitivity of the exposed individuals.

In order to reduce the effects that mold has on building occupants, procedures regarding the investigation and removal of mold are necessary. Facilities Management, Housekeeping, and Environmental Health and Radiation Safety (EHRS) will work jointly to ensure that all complaints regarding mold and mold contaminated materials are handled in a manner that results in minimal release of mold spores within the building. OSHA and the US EPA have published guidelines that should be followed when appropriate.

Assessment

Visual inspections should be done as part of routine building maintenance and when complaints are received. The extent of any water damage and mold growth should be visually assessed and the affected building materials identified. The visual inspection should also include hidden areas where damages may be present, such as crawl spaces, attics, and behind wallboard. Carpet backing and padding, wallpaper, moldings (e.g. baseboards), insulation and other materials that are suspected of hiding mold growth should also be assessed. Ceiling tiles, paper-covered gypsum wallboard (drywall), structural wood, and other cellulose containing surfaces should be given careful attention during a visual inspection. Ventilation systems should be visually checked for damp conditions and/or mold growth on system components such as filters, insulation, and coils/fins, as well as for overall cleanliness. Any underlying causes of moisture intrusion must be identified and corrected. An immediate response and thorough cleaning, drying, and/or removal of water-damaged materials will prevent or limit microbial growth.

Remediation

Routine mold remediation associated with visible mold or moldy odors will generally be addressed by Facilities Management and Housekeeping. All other concerns or requests for investigation shall be referred to EHRS.

Routine mold remediation by Facilities Management and Housekeeping may involve removal and/or remediation of mold contaminated materials if those materials being removed are:

- Ceiling tiles of 24 square feet or less; or
- Dry wall or other wall surface of 10 square feet or less.

Greater quantities of mold will often be remediated by a mold remediation contractor using established guidelines such as EPA or OSHA guidance.

The following procedures shall be followed for the investigation of mold concerns:

1. EHRS personnel will investigate, in a timely manner, and report their findings to the originating party and to Facilities Management and Housekeeping;
2. When the amount of affected area is beyond the amount listed above or if there are concerns regarding building occupant exposures, Facilities Management and Housekeeping will prepare a plan for remediation as necessary;
3. Remediation methods will be based on the size of the affected area, sensitivity of the potentially exposed population and established guidelines.
4. Appropriate personnel from EHRS, Facilities Management, and Housekeeping will coordinate the remediation of the mold with the qualified remediation contractor;
5. EHRS will provide guidance if requested or if the project size warrants.
6. Effective communication to affected building occupants will include a description of the remedial actions to be taken and a timetable for completion.

Guidelines for Removal of Small Areas of Mold Contamination

These guidelines are designed to minimize the release of mold spores in an indoor work environment. Other types of occupancies or extenuating circumstances may require more or less stringent procedures. If there is any doubt as to whether these procedures are appropriate, contact EHRS for recommendations.

As a general rule, simply killing the mold with a biocide is not effective to eliminate the hazard. The mold must be removed, since the chemicals and proteins, which can cause a reaction in humans, are still present in non-viable mold.

Non-Porous Surfaces

Mold can generally be removed from nonporous surfaces by wiping or scrubbing with water and detergent. It is important to begin drying these surfaces within 24-hours, to discourage further mold growth. Instructions for cleaning surfaces, as listed on product labels, should always be read and followed. Materials that are not completely dried within 72 hours should be considered for removal.

Non-Salvageable Items

Building materials and furnishings contaminated with mold growth that cannot be cleaned and decontaminated should be placed in sealed impermeable bags while in the remediation area. These materials can be discarded as

ordinary solid waste. It is important to contain mold-contaminated materials in this fashion to minimize the dispersion of mold spores into the building space.

The work area where mold removal is occurring should not be occupied. Removing people from spaces adjacent to the work area is not necessary, but is recommended for persons recovering from recent surgery, immune-suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

Containment of the work area is not always necessary but return airs should be sealed off and the room should be isolated from the building occupants, doors shut etc. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

The work area and areas used by remediation workers for egress should be cleaned with a damp cloth or mop and a detergent solution as necessary.

All areas should be left dry and visibly free from contamination and debris.

Personal Protective Equipment

Gloves, and eye protection are required during any mold remediation project. If remediation disturbs mold and mold spores become airborne, respiratory protection, such as an N-95 disposable respirator or powered air-purifying respirator (PAPR) is required. Actions that are likely to stir up mold include breakup of moldy porous materials such as wallboard, invasive procedures used to examine or remediate mold growth in a wall cavity, and actively stripping or peeling wallpaper to remove it. Employees wearing respiratory protection must be enrolled in the university's Respiratory Protection Program.