Clemson University

Indoor Air Quality Program

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# Introduction

There are currently no Indoor Air Quality (IAQ) specific regulations, nor are there any regulations for mold, pollen, allergens etc. Nevertheless, Clemson University is committed to providing a safe and clean indoor environment.

Employees have a right to a safe workplace; Federal and state law requires employers to provide their employees with working conditions that are free of known dangers. The OSH Act also prohibits employers from retaliating against employees for exercising their rights under the law (including the right to raise a health and safety concern or report an injury; for more information see www.whistleblowers.gov). It is the policy of Clemson University to maintain a safe and healthy work environment. Department Heads, Managers, and supervisors are responsible for the application and enforcement of University health and safety policies and procedures.

Clemson believes that the health and safety of students, faculty, and staff are of the greatest importance. Clemson will conduct its operations and construct and maintain its facilities in a manner conducive to the creation of a healthy and safe learning and work environment for all students, faculty, staff, and the surrounding community.

Clemson University has established administrative policies for the reduction and prevention of accidents and occupational illnesses, and the protection of the environment. These policies are to be used as a foundation for establishing safety and environmental health programs in each organization. Clemson operates its facilities and conducts its operations in compliance with all applicable regulation to protect Students, Faculty and Staff, University property, the external community, and natural resources and the environment.

# Program Description

The purpose of the Indoor Air Quality Plan at Clemson University is to establish and maintain a program for safeguarding acceptable Indoor Air Quality, and establish a method for investigating IAQ concerns. The requirements of this written program apply to all indoor environments occupied by University employees/students. This program also applies to contractors and their subcontractors whose operations may impact University employees/students.

The IAQ effort at Clemson is coordinated by Environmental Safety. For University buildings under the care of University Facilities (UF), UF has designated the Director of Maintenance as the contact for IAQ issues. For University buildings under the care of Housing Facilities, Housing and Dining has designated the Director of Maintenance as the contact for IAQ issues. For off-campus facilities the facility Director is the IAQ contact.

These guidelines apply to all Clemson University spaces: offices, classrooms, shops, labs, housing facilities, dining facilities, and athletic facilities.

Environmental Safety (ES) uses guidelines from the American Conference of Governmental Industrial Hygienists (ACGIH), American Industrial Hygiene Association (AIHA), and the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) as the standards for the University’s program.

# Causes of poor IAQ

Poor IAQ could possibly affect the health and comfort of students and employees. IAQ is influenced by temperature/humidity, insufficient outside air being introduced into the HVAC system, odors from outside sources being introduced into the system or inside odors being recirculated, or insufficient cleaning and poor housekeeping.

Indoor air quality (IAQ) involves the contents of indoor air that could affect the health and comfort of building occupants. IAQ is influenced by a variety of factors, the most common being:

* Temperature and humidity;
* Insufficient outside air being introduced into the Heating, Ventilation, and Air Conditioning (HVAC) system;
* Insufficient circulation of air;
* Odors from outside sources being introduced into the system or inside odors being recirculated;
* Water Intrusion not remediated within 24-48 hours; and
* Insufficient cleaning.

Failure to respond to indoor air quality concerns in a timely and appropriate manner can have numerous detrimental consequences such as:

* Increasing long and short term health problems such as cough, eye irritation, headache, asthma attacks and allergic reactions. In rare instances, allergic reactions may lead to life-threatening conditions such as severe asthma attacks, Legionnaire’s disease or carbon monoxide poisoning;
* Promoting the spread of airborne infectious diseases;
* Producing an unfavorable work and learning environment;
* Reducing the productivity of staff and students due to discomfort, sickness, or absenteeism;
* Accelerating the deterioration and thus reducing the efficiency of the Heating, Ventilation and Air Conditioning (HVAC) equipment;
* Increasing the risk that areas will have to be closed and the occupants temporarily relocated;
* Creating potential liability problems.

# IAQ problem indicators

Indicators which may indicate the need to formally assess the IAQ status of an area include:

* Strong Odors (especially “chemical” odors)
* Dirty or unsanitary conditions
* Visible fungal growth or moldy odors
* Evident moisture in inappropriate locations (e.g., moisture on walls, floors, or staining or discoloration of building material(s)
* Smoke damage
* Potential for soil gas entry (e.g., cracks or holes in adjacent building surfaces adjacent)
* Uneven temperatures
* Overcrowding
* The presence of personal air cleaners (e.g., ozone generators, portable filtration units) or fans
* Blocked vents

# IAQ Investigation

Any department, employee, student, parent, or visitor may submit a request for evaluation of the environmental, health, or safety environment for a property owned or occupied by Clemson University. Requests for investigations should be directed to the Clemson University Office of Environmental Safety (ES) for review.

ES will receive the request and initiate an investigation; currently the University uses a 3rd party consultant for IAQ evaluation and/or sampling. Facilities will participate in the investigation process if appropriate.

**For temperature, odor or smell complaints, suspected water leaks, or visible mold**:

1. The occupant reports their concern to ES via the **online survey** (IAQ report).
2. ES or a designated consultant will interview building occupants and conduct a building survey.
3. The occupant may be requested to complete an IAQ log to track odors, or conditions to better assist in the investigation.
4. ES will refer the complaint to University Facilities (UFac) or other appropriate Facilities group if necessary.
5. The appropriate facilities group is responsible for making any necessary repairs.

Investigation and remediation of IAQ concerns is a joint effort between ES, the appropriate facilities group, and the occupant(s) reporting the problem. Complex situations (e.g., large areas of complaints, mechanical malfunctions, intermittent odors, etc.), may take time to reach a resolution. In each case, UFac (or other appropriate facilities group) and ES will keep building residents informed of progress in addressing the situation. For water intrusion or leaks that have impacted building materials which are not cleaned up within 48 hours, or are reported to UFac past the 48 hour window for cleanup, or the time of leak is unknown, ES should be notified immediately.

# Responsibilities of University Facilities (or other Clemson Facilities organization)

University Facilities is responsible for maintaining and operating the E&G spaces, Housing Facilities is responsible for residential and dining spaces, and Athletic Facilities maintains all athletic buildings, grounds, and offices.

Each group is charged with keeping their assigned spaces in good condition and within the parameters which they were/are designed to operate. This includes providing for adequate indoor air quality and occupant comfort within the operating building parameters, bearing in mind that each building has a different system and parameters.

This responsibility includes inspection, maintenance and repair of HVAC and structural components associated with the interior and exterior of the buildings. Each will take reasonable steps to see that HVAC (Heating, Ventilation, Air Conditioning) systems are operating properly, checking and performing filter changes in HVAC units as needed. Each will contact ES when IAQ concerns become more complex and involve further investigation beyond their work scope.

# Responsibilities of ES

ES is responsible for working with UFac or other Facilities group and the occupant(s) as needed to perform interviews and indoor air quality investigations to develop a plan to assist in locating and remediating the source(s) of the occupants’ IAQ concerns.

# How to Conduct an Initial Survey of the Area:

1. Survey the area of concern for the following:
	1. Chemicals stored in open containers (i.e., cleaners, paints, etc.);
	2. Visible mold or mildew growth;
	3. Odors caused by outside activities (e.g., cigarette smoke, construction activities, engine exhausts, garbage, etc.);
	4. Ionizing air cleaners;
	5. Copiers;
	6. House plants; or,
	7. Anything else that could possibly be the cause of the occupant’s IAQ concern.
2. Ask how long that the IAQ problem has been occurring.
3. Ask whether the IAQ problem is continuous or intermittent.
4. If the source of the IAQ problem cannot be readily identified, then it is helpful to ask the room occupant to keep a log about the nature of the problem and the surrounding conditions, describing any pattern or other aspects that will help uncover the cause of the IAQ problem. The log will be used to focus on the most likely causes and times of the problem and could expedite a solution.

# How to Minimize IAQ Problems:

IAQ problems can be minimized by occupants doing the following:

* Do not block or shut vents or building returns.
* Do not block thermostats with furniture or equipment.
* Observe the University’s NO SMOKING Policy.
* Dispose of food waste and containers in receptacles that are emptied daily.
* Do not over water plants and do not allow mold growth to occur in the dirt.
* Clean up water or other liquid or food-based spills IMMEDIATELY.
* Report water intrusion and sewage problems IMMEDIATELY to UFac or appropriate facilities group.
* Avoid concentrating electronic office equipment within small, unventilated areas.
* Do not burn candles or have other scent-producing materials.

# Reporting

Report to the appropriate Facilities group the following:

## Water intrusion (leaks)

**IMMEDIATELY report leaks or other water intrusion.**

Include, to the extent known, the following information:

a. Source and approximate quantity of water,

b. Affected areas,

c. Water-damaged materials, and

d. Whether or not the source has been controlled.

**Note that even clean water left for more than 24-48 hours can lead to mold and mildew growth.**

## Sewage backflows

**IMMEDIATELY report sewage backflows to UFac or other appropriate Facilities group.**

ES is notified by the appropriate group about water intrusion incidents that have occurred and which have impacted building materials and provides information that the situation has been repaired and wet materials dried or removed.

# Contacts

Natural gas leaks on the main campus should be reported IMMEDIATELY toPublic Safety at (864) 656-2222.

Non-emergency IAQ complaints/odors can be reported to UFac at (864) 656-2186 or use the IAQ report form.

If UFac is unable to identify and resolve the problem, the department should contact ES at EHS@Clemson.edu.

# Appendix A – IAQ report

Answer all questions or indicate if the question does not apply to your situation. Provide as much information as you feel necessary to adequately describe your indoor air quality situation.

# Contact information (optional)

**Your Name**

**Job Title:**

**Department:**

**Building/room #:**

**Phone:**

**Email*:***

1. **Briefly describe your air quality concerns including the specific location(s) of the concern:**
2. **Indicate if you frequently have any of the following complaints concerning the indoor air quality at your building.** *(circle all that apply)*

Dusty Too hot

Noisy Too cold

Stuffy Air Too dry

Moldy or musty odors Too humid

Visible mold Drafty

Stuffy Air Vibration

Crowded work area

Other

**3. When did these problems begin and when do they occur?**

* Month/year when problem began:
* What time of day do you experience the problem? *(circle one)*  morning / afternoon / all day
* Are there specific day(s) of the week that you experience the problem?  *(circle all that apply)*

Monday / Tuesday / Wednesday / Thursday / Friday / Saturday / Sunday

* Is there a specific time of year that you experience the problem? Yes/No

Specify when:

1. **What health symptoms have you experienced?** Check any symptoms you are experiencing in your building.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Symptom** | **Occasionally** | **Frequently** | **Not related to building** | **Appears after arrival** | **Increases after arrival** |
| Difficulty in concentrating |  |  |  |  |  |
| Dry or sore throat |  |  |  |  |  |
| Aching joints |  |  |  |  |  |
| Muscle twitching |  |  |  |  |  |
| Back pain |  |  |  |  |  |
| Hearing problems |  |  |  |  |  |
| Dizziness |  |  |  |  |  |
| Headache |  |  |  |  |  |
| Dry, flaking skin |  |  |  |  |  |
| Discolored skin |  |  |  |  |  |
| Skin irritation |  |  |  |  |  |
| Itching |  |  |  |  |  |
| Heartburn |  |  |  |  |  |
| Nausea |  |  |  |  |  |
| Noticeable odors |  |  |  |  |  |
| Sinus congestion |  |  |  |  |  |
| Sneezing |  |  |  |  |  |
| Wheezing |  |  |  |  |  |
| High stress levels |  |  |  |  |  |
| Chest tightness |  |  |  |  |  |
| Eye irritation |  |  |  |  |  |
| Fainting |  |  |  |  |  |
| Hyperventilation, shortness of breath |  |  |  |  |  |
| Problems with contacts |  |  |  |  |  |
| Fatigue/drowsiness |  |  |  |  |  |
| Temperature too hot |  |  |  |  |  |
| Temperature too cold |  |  |  |  |  |
| Other (specify) |  |  |  |  |  |

* Do these symptoms clear up within 1-2 hours after leaving work? Yes / No

If no, do they clear up overnight? Yes / No

If no, do they clear up over the weekend? Yes / No

If no, do they clear up after vacation? Yes / No

* If all symptoms do not clear up when away from the building, which symptoms persist when away from your workplace throughout the week?

* Have you sought medical attention for your symptoms? Yes / No

If yes, please describe:

* Do you have any allergies or other health problems that may account for any of the listed health symptoms? Yes / No
* If yes, please describe:
* Have any of your symptoms reduced your ability to work, caused you to stay home from work or caused you to leave work early? Yes / No

If Yes, please explain:

* How many hours per day do you typically spend in this building?
* How many hours per day are you at your workstation?
* Do any of your co-workers have similar symptoms of which you are aware? Yes / No
1. **Indicate if any of the following apply to you.** *(circle all that apply)*

Wear contact lenses

Operate video display or computer terminals How many hours per day?

Operate photocopier machines at least 10% of the work day

Operate other office machines or equipment List:

Use any chemical substances such as cleaners, white out, etc.

1. **Have there been any renovation/demolition-related activities occurring in or near your work area within the past week?** (i.e., new carpeting, painting, new office furniture, HVAC work, etc.) Yes / No

Yes / No If Yes, Please list:

1. **Has there been any evidence of water leaks or visible signs of moisture in and around your area?**

Yes / No If Yes, Please describe:

1. **Is your office near a laboratory?**

Yes / No If Yes, Please describe:

1. **Briefly describe your primary job tasks:**

Do any of these tasks produce dust or odor or use toxic substances? Yes / No

If Yes, please list or describe:

1. **Do you have an idea as to what is the cause of symptoms in your workplace?** Yes / No

If Yes, Please describe:

1. **Can you offer any other comments or observations that may be helpful in determining the environmental condition within your workplace?**

**Thank you for completing this form.**

**We will use your information to assist with investigating symptoms in your workplace.**

# Appendix B - Definitions

**Aerosol** are liquid droplets or solid particles dispersed in air; these particles range in size from 0.01 µm to 100µm, and can remain suspended in air for a long time.

**Allergen** is a substance (such as dust mites, mold or mold spores) that can cause an allergic reaction.

**Antimicrobial** is an agent which kills microbial growth. See disinfectant, sanitizer, and sterilizer.

**Bacteria** is a microbe; a one-celled organism which are members of the biological kingdom Protista.

**Bioaerosol** is an aerosol of biological material, such as microorganisms or body fluids.

**Breathing zone** in Industrial Hygiene “breathing zone” refers to the area from which the employee draws air; as close as possible to the nose and mouth and a hemisphere forward of the shoulders with a radius of 6 to 9 inches. The definition of “breathing zone” from ASHRAE is “the region within an occupied space between planes 3 and 72 in (75 and 1800 mm) above the floor and more than 2 ft (600 mm) from the walls or fixed air-conditioning equipment”.

**Building Related Illness** is a term used by the EPA when symptoms of diagnosable illness are identified and can be attributed directly to airborne building contaminants.

**Disinfectant is o**ne of three groups of antimicrobials registered by EPA for public health uses. EPA considers an antimicrobial to be a disinfectant when it destroys or irreversibly inactivates infectious or other undesirable organisms, but not necessarily their spores. EPA registers three types of disinfectant products based upon submitted efficacy data: limited, general or broad spectrum, and hospital disinfectant

**Fungi** are unicellular or multicellular organisms which do not carry out photosynthesis; they are neither animals nor plants and are classified in a kingdom of their own. Fungi include molds, yeasts, mushrooms, and puffballs, and reproduce by making spores. In this document, the terms fungi and mold are used interchangeably. Molds can grow on virtually any organic substance, providing moisture and oxygen are present.

**Fungicide** is a substance or chemical that kills fungi.

**Hypersensitivity diseases** are characterized by allergic responses to airborne contaminants. The hypersensitivity diseases usually associated with indoor air quality are asthma, rhinitis, and hypersensitivity pneumonitis.

**Microorganisms** are life forms too small to be viewed by the unaided eye, like bacteria or individual mold spores.

**Microbiological** is an adjective that describes anything which pertains to *Microbiology*, which is a branch of biology dealing with microorganisms.

**Mildew** describes the coatings or discolorations caused by fungi on objects when exposed to moisture.

**Mold** is a type of fungi. See “Fungi” above.

**Mold spores** are in essence the microscopic “seeds” of fungi. Mold spores are constantly present in both the indoor and outdoor air; although typically outdoor air contains significantly more mold spores than indoor air. When mold spores land on a damp spot indoors, they may begin growing and digesting whatever they are growing on. At one point the CDC had concerns over “toxic mold spores” (specifically *Stachybotris* *chartarum*), but the studies those concerns were based on turned out to be fraudulent.

**Off-gassing** the release of gases such as organic vapors, from a building material after the manufacturing process is complete.

**Pollutant pathway** is the method of entry into the occupant’s working/living space of a contaminant from it’s source; often architectural or mechanical connections (e.g., through cracks in walls, vents, open windows).

**PPM** means “parts per million”, a term used for very small concentrations, usually of contaminants in a medium such as air or water.

**Psychosocial factors** are psychological, organizational, and personal stressors that can produce symptoms similar to poor indoor air quality.

**Sanitizer** is one of three groups of antimicrobials registered by EPA for public heath uses. EPA considers an antimicrobial to be a sanitizer when it reduces but does not necessarily eliminate all the microorganisms on a treated surface. To be a registered sanitizer, the test results for a product must show a reduction of at least 99.9% in the number of each test organism over the control.

**Sick building syndrome** is used by the EPA to describe situations in which building occupants experience acute health and comfort effects that appear to be linked to time spent in a building, but no specific illness or cause can be identified. The complaints may be localized in a particular room or zone, or may be widespread throughout the building.

**Soil gases** are gases that enter a building from the surrounding ground (e.g., radon, volatile organic compounds).

**Sterilizer** is one of three groups of antimicrobials registered by EPA for public health uses. EPA considers an antimicrobial to be a sterilizer when it destroys or eliminates all forms of bacteria, fungi, viruses, and their spores. Because spores are considered the most difficult form of a microorganism to destroy, EPA considers the term sporicide to be synonymous with sterilizer.

**Tracer gases** are compounds, such as sulfur hexafluoride, which are used to identify suspected pollutant pathways and to quantify ventilation rates. Trace gases may be detected qualitatively by their odor or quantitatively by air monitoring equipment.

**Viruses** are considered part of the microbial world, but are not cells. A Virus particle is a piece of genetic material protected by a surrounding protein coat.

**Volatile Organic Compounds (VOCs)** are compounds that vaporize (become a gas) at room temperature. Common sources which may emit VOCs into indoor air include housekeeping and maintenance products, and building and furnishing materials. In sufficient quantities, VOCs can cause eye, nose, and throat irritations, headaches, dizziness, visual disorders, memory impairment; some are known to cause cancer in animals; some are suspected of causing, or are known to cause, cancer in humans. At present, not much is known about what health effects occur at the levels of VOCs typically found in public and commercial buildings.