UTRGV - Proactive Characterization and Resolution of IAQ Related Problems

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Safety
Is In Everyone's Job Description

Presentation Goals

- Provide an overview of Indoor Air Quality the EHSRM perspective
- Familiarize the audience the importance of providing acceptable indoor air quality
- Familiarize the audience with the terms associated with indoor air quality
- Introduce the “Industrial Hygiene “ aspect of Indoor Air Quality.

“Industrial Hygiene”

- Industrial Hygiene is a science and art devoted to the anticipation, recognition, evaluation, prevention, and control of those environmental factors or stresses arising in or from the workplace which may cause sickness, impaired health and well being, or significant discomfort among workers or among citizens of the community.

Applicable Standards

- **ASHRAE 62.1- Ventilation for Acceptable Indoor Air Quality** The purpose of this standard is to specify minimum ventilation rates and other measures intended to provide indoor air quality that is acceptable to human occupants and that minimizes adverse health effects.
- **ASHRAE 55 -Thermal Environmental Conditions for Human Occupancy -** The environmental factors addressed in this standard are temperature, thermal radiation, humidity, and air speed; the personal factors are those of activity and clothing.

Proactive Approach to IAQ Issues

- Proactive approach to IAQ issues involve a “team” effort including
  - Facilities
    - Leadership
    - Maintenance
    - HVAC
    - Custodians
  - Energy Manager
  - Manager - Special Projects
  - EHSRM

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EHSRM Role

- “ Each employer (1) shall furnish to each of his employees employment and a place of employment that are **free from recognized hazards** that are causing or are likely to cause death or serious physical harm to his employees “
  translates to :
- Each employer shall furnish each of his employees employment and a place of employment within those comfort parameters established by ANSI and AHSRAE.

WHERE WE ARE AT

In the Valley …..Mold is Gold!

SATURDAY
JUNE 1, 2002
HARLINGEN, TEXAS
Valley Morning Star

Valley D

$15.7 million OK'd for mold removal

Officials declare emergency for Econo Medes High School

By JUAN OZUNA
The Monitor

EDINBURG — School district officials have declared an emergency and approved more than $15.7 million for the removal of mold discovered recently at Johnny Econo-medes High School.

Public information officer Gilbert Tagle said the Dallas-based Assured Indoor Air Quality company released a 12-page report in April documenting the presence of mold caused by moisture in several areas of the school.

Administrators of the $26 million facility, built by Austin-based Landmark Organization, were aware of air quality problems at the school since it opened in August 2000, citing wet ceiling panels and a warped gym floor, Tagle said.

"They had on-and-off suspicions (of poor air quality) since the school opened," Tagle said. "They had been doing the best they could to keep the classrooms clean."

The district hired AIAQ in March to begin in-depth testing at the school after a preliminary investigation by the air firm suggested mold on the campus.

At Thursday's special meeting, the board of trustees first approved a declaration of emergency, which allows the district to take spending action necessary to remediate health hazards without having to wait for bidders.

The board then approved the hiring AIAQ as manager of the mold remediation project.

According to the report issued in April by the company, the moisture-induced mold at the school — found in ceiling air systems, several doorways and in locker rooms — was linked to problems with the heating and ventilation air conditioning system.

Tagle said it had not been determined if structural problems were part of causing the mold, a claim being made against Landmark by the Pharr-San Juan-Alamo school district for problems at the Landmark-constructed PSJA High School.

"There are some positions you don't want to take right away," Tagle said.

Terri Dusek, communications director for Landmark, called the Edinburg school district board's decision to declare an emergency "questionable."

"Landmark has not been informed by this school district of any issues regarding the actions at tonight's (Thursday) board meeting," Dusek said.

She said the company also expressed concern about hiring AIAQ to manage the mold removal project.

"The numerous instances of Assured getting multi-million dollar bids throughout the Valley without competitive bidding is a huge concern," said Wanda Harkness, an attorney for Landmark.

"We have been told by experts in the indoor air quality field that it is at least bad business — and at most unethical — to allow the same company that does the testing to do the correction."

Board members agreed that the rationale behind quickly hiring AIAQ was the immediate resolution of the mold problem before the new school year begins, a process that would be hindered by waiting for contractors to submit bids.

AIAQ is expected to begin work on the school Monday, Tagle said, which will include removal of the mold and using equipment to dry up moist conditions.

The company will eventually have to reconfigure the heating and cooling system, Tagle said.

That process will still be under way at the start of next school year.

"They're trying to get it fixed so that the kids and staff can have a safe working environment," Tagle said.

"They'll probably have to use temporary buildings while they (AIAQ) are working on key parts of the school."

THE MONITOR

Valley&State

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SECTION C

SATURDAY JUNE 8, 200

Mental health center to evacuate mold-filled buildings

By ELIZABETH PIERSON
The Monitor

EDINBURG — The Tropical Texas Center for Mental Health and Mental Retardation board of trustees has declared a state of emergency for its main campus buildings, saying they are contaminated with mold.

All offices and clinics in the two buildings at 1901 S. 24th St. will be evacuated by the end of August "due to health and safety risks to susceptible individuals," according to a declaration signed by five members of the nine-person board at its regular meeting May 28.

Clinical services from the center will move to a building on Sugar Road near Edinburg Regional Medical Center. Renovations began this week on the Sugar Road site, said Michelle Lozano, director of public affairs and business development for Tropical Texas. All services are still offered at the main campus, she said.

"We are trying to be extremely proactive. As soon as I get the details about the client services and the plan for evacuation, I'll be disclosing that."

— Michelle Lozano,
director of public affairs and business development, Tropical Texas Center for Mental Health and Mental Retardation

It has not yet been determined where administrative offices will go while officials decide what to do with the allegedly contaminated buildings, Lozano said.

"We are trying to be extremely proactive," she said. "As soon as I get the details about the client services and the plan for evacuation, I'll be disclosing that."

Dallas-based Assured Indoor Air Quality conducted a study earlier this year that found moisture had leaked into the two buildings because of "critical building structure/construction deficiencies," according to the board's declaration. The declaration said the moisture caused "microbiological contamination," which could pose a safety risk to people in the building.

Lozano said Assured Indoor Air Quality and MHMR officials conducted information sessions with employees at the building to teach them about the findings of the study and the possible symptoms of mold contamination.

"At the present time, we have not had any employee subm

See MHMR page 8

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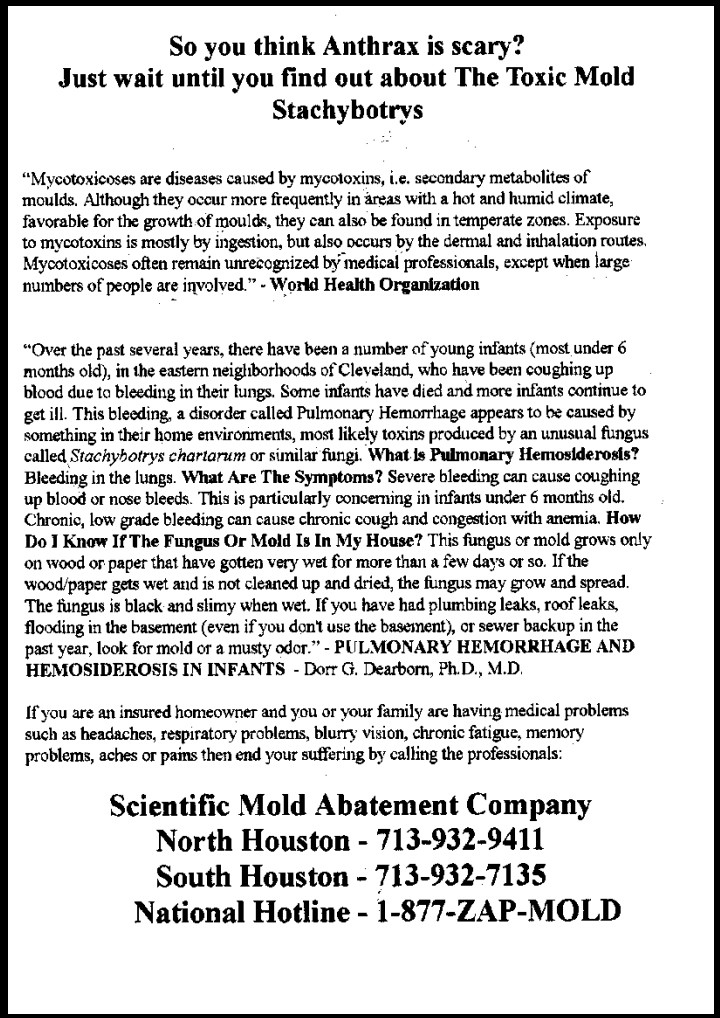
A Summary of Mold Claims

- *PSJA – 20 Million Dollar cleanup (52 million dollar health claim related lawsuit)*
- *Economedes High School - 15 million Dollar clean up*
- *Alamo High School – 22 million dollar cleanup*
- *San Benito Elementary – 1.4 million cleanup*
- *San Benito High School – 4.4 million cleanup*
- *Santa Rosa – High School- closed*
- *Average residential mold claim in South Texas exceeds the price of the house*
- *Estimated that in Texas alone - 128 million dollars in mold claims in 2001*

Bordering on the Ridiculous….

- Dallas journalist Joanna Windham believes mold in her apartment is responsible for her dog's getting cancer. (Rose Farley, "Attack of the black mold", Dallas *Observer*, Feb. 22).



So you think Anthrax is scary?
Just wait until you find out about The Toxic Mold Stachybotrys

"Mycotoxicoses are diseases caused by mycotoxins, i.e. secondary metabolites of moulds. Although they occur more frequently in areas with a hot and humid climate, favorable for the growth of moulds, they can also be found in temperate zones. Exposure to mycotoxins is mostly by ingestion, but also occurs by the dermal and inhalation routes. Mycotoxicoses often remain unrecognized by medical professionals, except when large numbers of people are involved." - **World Health Organization**

"Over the past several years, there have been a number of young infants (most under 6 months old), in the eastern neighborhoods of Cleveland, who have been coughing up blood due to bleeding in their lungs. Some infants have died and more infants continue to get ill. This bleeding, a disorder called Pulmonary Hemorrhage appears to be caused by something in their home environments, most likely toxins produced by an unusual fungus called *Stachybotrys chartarum* or similar fungi. **What is Pulmonary Hemosiderosis?** Bleeding in the lungs. **What Are The Symptoms?** Severe bleeding can cause coughing up blood or nose bleeds. This is particularly concerning in infants under 6 months old. Chronic, low grade bleeding can cause chronic cough and congestion with anemia. **How Do I Know If The Fungus Or Mold Is In My House?** This fungus or mold grows only on wood or paper that have gotten very wet for more than a few days or so. If the wood/paper gets wet and is not cleaned up and dried, the fungus may grow and spread. The fungus is black and slimy when wet. If you have had plumbing leaks, roof leaks, flooding in the basement (even if you don't use the basement), or sewer backup in the past year, look for mold or a musty odor." - **PULMONARY HEMORRHAGE AND HEMOSIDEROSIS IN INFANTS** - Dorr G. Dearborn, Ph.D., M.D.

If you are an insured homeowner and you or your family are having medical problems such as headaches, respiratory problems, blurry vision, chronic fatigue, memory problems, aches or pains then end your suffering by calling the professionals:

Scientific Mold Abatement Company
North Houston - 713-932-9411
South Houston - 713-932-7135
National Hotline - 1-877-ZAP-MOLD

Looking at it from a Different Perspective…Why are kids sleeping in class?

- Thirty to seventy million people exposed to potential building related health problems (Labor Institute, 93)
- United Nations estimates poor IAQ results in 2.2 million deaths/yr (98)
- Cost of headaches alone for employees of the US EPA is in the range of $375,000-$2,00,000 annually (Wallace, 95)
- Sick Building Syndrome (SBS) costs exceed $1 billion annually in medical expenses and $10 billion annually in productivity (Woods, 89)
- Sick Building Syndrome (SBS) costs the nation $60 billion / year in absenteeism and lost productivity (Matill, 93)

THE FUTURE- A HEALTHCARE ENVIRONMENT

Classes With Special Exposure

- **Hospitals and HPublic Entities-** Defendants in their own capacity but also in their exercise to protect the public
- **Schools –** Media , children, and budget cuts
- **ealth Care Facilities – immuno compromised individuals – Aspergillus's is leading cause of death in leukemia patients**
- **Exterior Insulating Finishing System** (EIFS) manufactures, Installers

Liability Insurance Claims

- A 1997 study of 8600 claims by DPIC (architects, engineers, and environmental consultants)
- HVAC problems represented 61% of the total claims dollars
- Mechanical Engineers (47% of total claims)
- Architects - represented 6% of claims, dollars paid and 7% of the number of claims.
- During the study period DPIC paid out $18.4 million in 44 claims in behalf of the insured mechanical consulting engineer and architect policyholders.
- An additional $7 million was paid by other parties such as contractors, vendors, other design professionals not insured by DPIC.
- Many claims are settled out of court since the cost of litigation is considerable.

Allegations - Design Phase

- **HVAC System design**
  - inadequate outside air,
  - poor intake louver location
  - inadequate cooling,
  - improper air mixing at zones
- Improper specification of furnishings and equipment
- Design of placement and type of vapor retardation systems, exterior wall design

Preliminary Design Meeting

- Total Meeting length (56 minutes)
  - Placement of individuals – 14 minutes
  - Color of walls – 13minutes
  - Furniture – 11 minutes
  - Design of building sign – 8 minutes
  - Parking lot access – 8 minutes
  - **HVAC System – 4 minutes**

P.S. You don't get sued for the color of walls!

Allegations - Construction

- Improper storage of building materials (wet wallboard) and
- Improper installation (such as condensate drains)
- Loose construction (exterior walls and parking garages)
- Improper sealing of joints and windows
- Poor setup (improper air balance, temperature control system)
- Interior wall and floor coverings unsuited for climate

Equipment and Preventive Maintenance

- Equipment that does not perform to specifications (chillers, filters, etc.)
- Owners may not change air filters on schedule, reduce dilution rates (to save energy), remodel or change occupancy without changing ventilation
- Locate garage bins near intakes, use poor filtration for vacuuming, improper cleaning chemicals, and add polluting equipment (copiers, printers, developers, etc.).

INDOOR AIR QUALITY

A Look at Indoor Air Pollutants

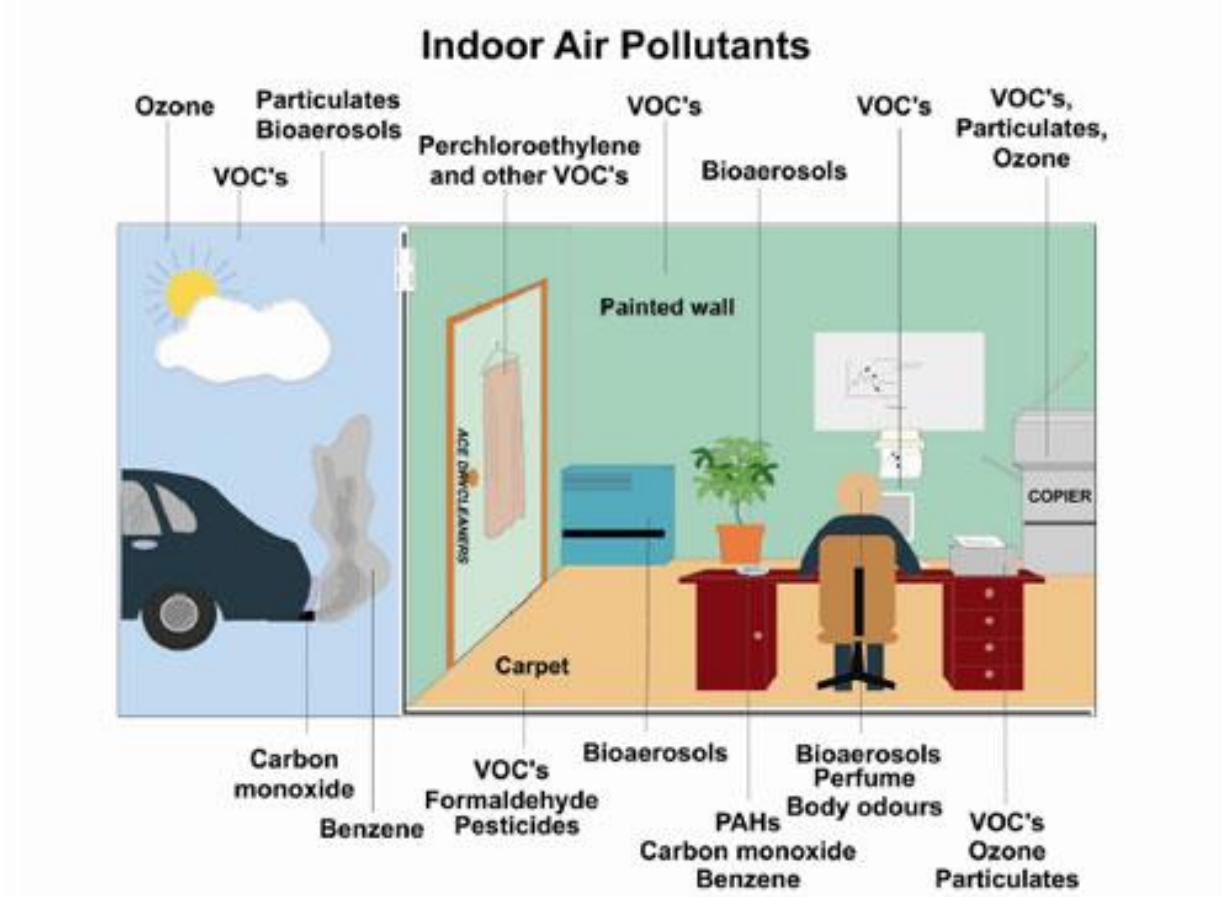
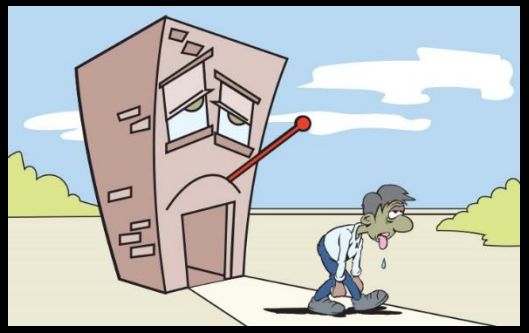


Figure 1 Primary sources of indoor air pollution

Sick Building Syndrome

- The sick building syndrome comprises of various nonspecific symptoms that occur in the occupants of a building. This feeling of ill health increases sickness absenteeism and causes a decrease in productivity of the workers. As this syndrome is increasingly becoming a major occupational hazard, the cause, management and prevention of this condition have been discussed in this article.
- Headache, dizziness, nausea, eye, nose or throat irritation, dry cough, dry or itching skin, difficulty in concentration, fatigue, sensitivity to odors, hoarseness of voice, allergies, cold, flu-like symptoms, increased incidence of asthma attacks and personality changes.



Sick Building (NIH)

- If 20% of the work force has symptoms -- including watering eyes; hoarseness; headaches; dry, itchy skin; dizziness; nausea; heart palpitations; miscarriages; shortness of breath; nosebleeds; chronic fatigue; mental fogginess; tremors; swelling of legs or ankles; and cancer -- the building may be labeled a "sick building." The telling factor is if the symptoms ease when workers are at home or on vacation.

The Cost of SBS

- Sick building syndrome (SBS) costs companies millions every year through employee absenteeism, decreased productivity and even increased health care premiums.
- The U.S. Environmental Protection Agency (EPA) ranks indoor air pollution, commonly called sick building syndrome, costs businesses **$60 billion annually.**
- **In addition, some costs are less apparent, at least initially, because they stem from the emotional impacts of SBS which often create exaggerated responses (**

Building Related Illness (BRI)

- EPA placed these illnesses in a second category called building-related illness (BRI)
  - Symptoms include coughing, chest tightness, fever, chills and muscle aches, and they don't clear up after you leave the building.
  - Asthma is a Building Related Illness and directly related to damp buildings
  - BRI is a diagnosed illness which can be linked directly to exposure to contaminants in a building's air.
  - BRI

Mold Exposure

- **Allergic reactions can be triggered "visually"**
- Molds can cause adverse effects by producing allergens (substances that can cause allergic reactions). Potential health concerns are important reasons to prevent mold growth and to remediate existing problem areas.
- The onset of allergic reactions to mold can be either immediate or delayed. Allergic responses include hay fever-type symptoms such as runny nose and red eyes.
- Molds may cause localized skin or mucosal infections but, in general, do not cause systemic infections in humans, except for persons with impaired immunity, AIDS, uncontrolled diabetes, or those taking immune suppressive drugs. An important reference with guidelines for immuno-compromised individuals can be found at the Centers for Disease Control and Prevention (CDC) website.
- Molds can also cause asthma attacks in some individuals who are allergic to mold. In addition, exposure to mold can irritate the eyes, skin, nose and throat in certain individuals. Symptoms other than allergic and irritant types are not commonly reported as a result of inhaling mold in the indoor environment.
- Some specific species of mold produce mycotoxins under certain environmental conditions. Potential health effects from mycotoxins are the subject of ongoing scientific research and are beyond the scope of this document.

IAQ AT A BUILDING LEVEL

Keys to Better IAQ

- Scientific Studies tell us that the four factors in reducing IAQ complaints are the following
  - Increased Ventilation Rates
  - Better Control of Indoor Temperatures
  - Reducing Dampness and Mold
  - Improved Particle Filtration
- Maintaining Parameters within recommended ASHRAE/ANSI guildines will reduce IAQ complaints and maintain a comfortable work environemt.

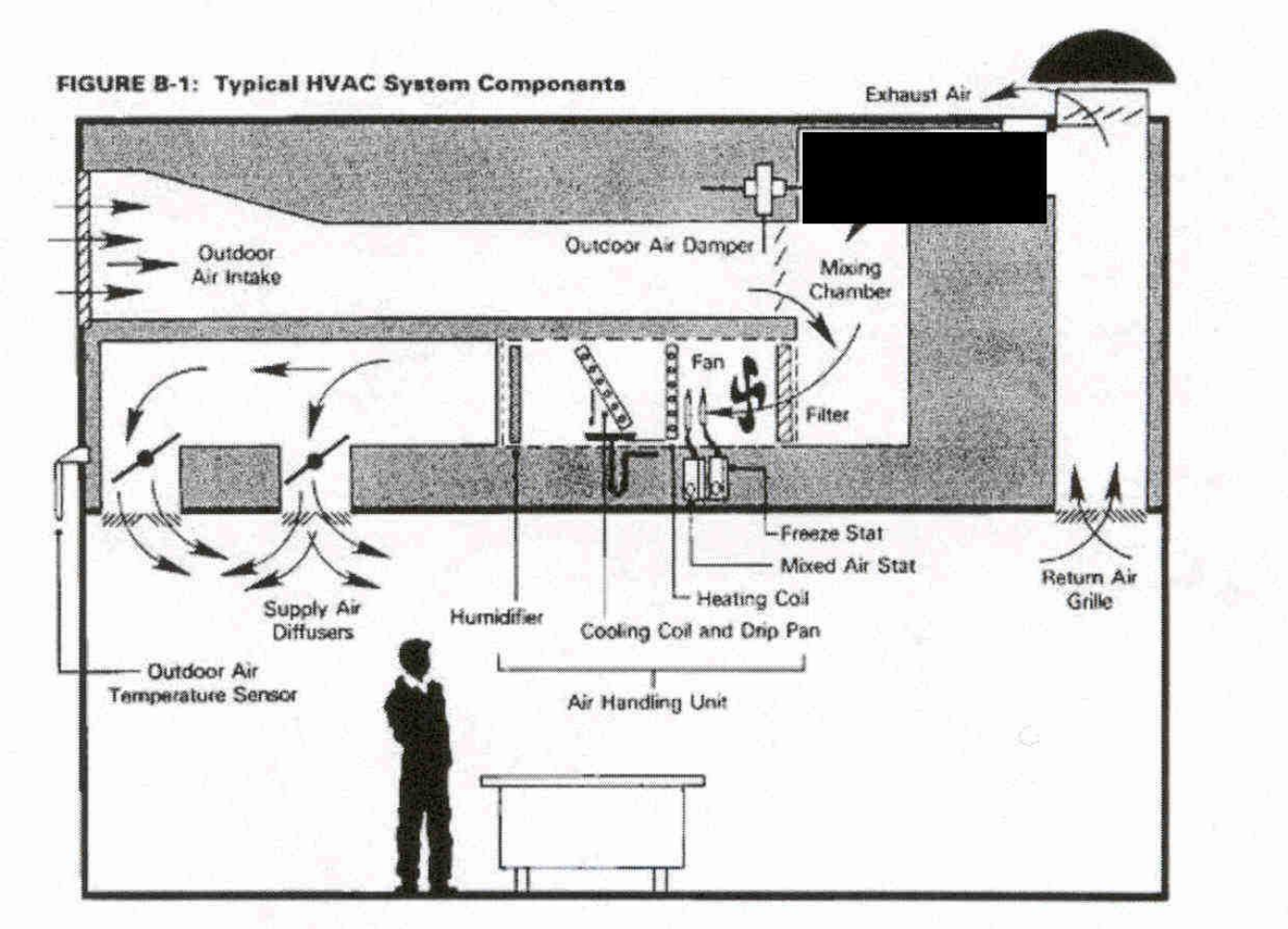
Primary Problems in “Sick Buildings”

- NIOSH*: primary problems found in 529 buildings studied through 1990:
  - HVAC 52%
  - Contamination (inside) 15%
  - Contamination (outside) 10%
  - Microbial 5%
  - Building fabric 4%
  - Unknown 13%

*Crandall & Sieber,Appl.Occ.Env.Hyg.11:533,1996

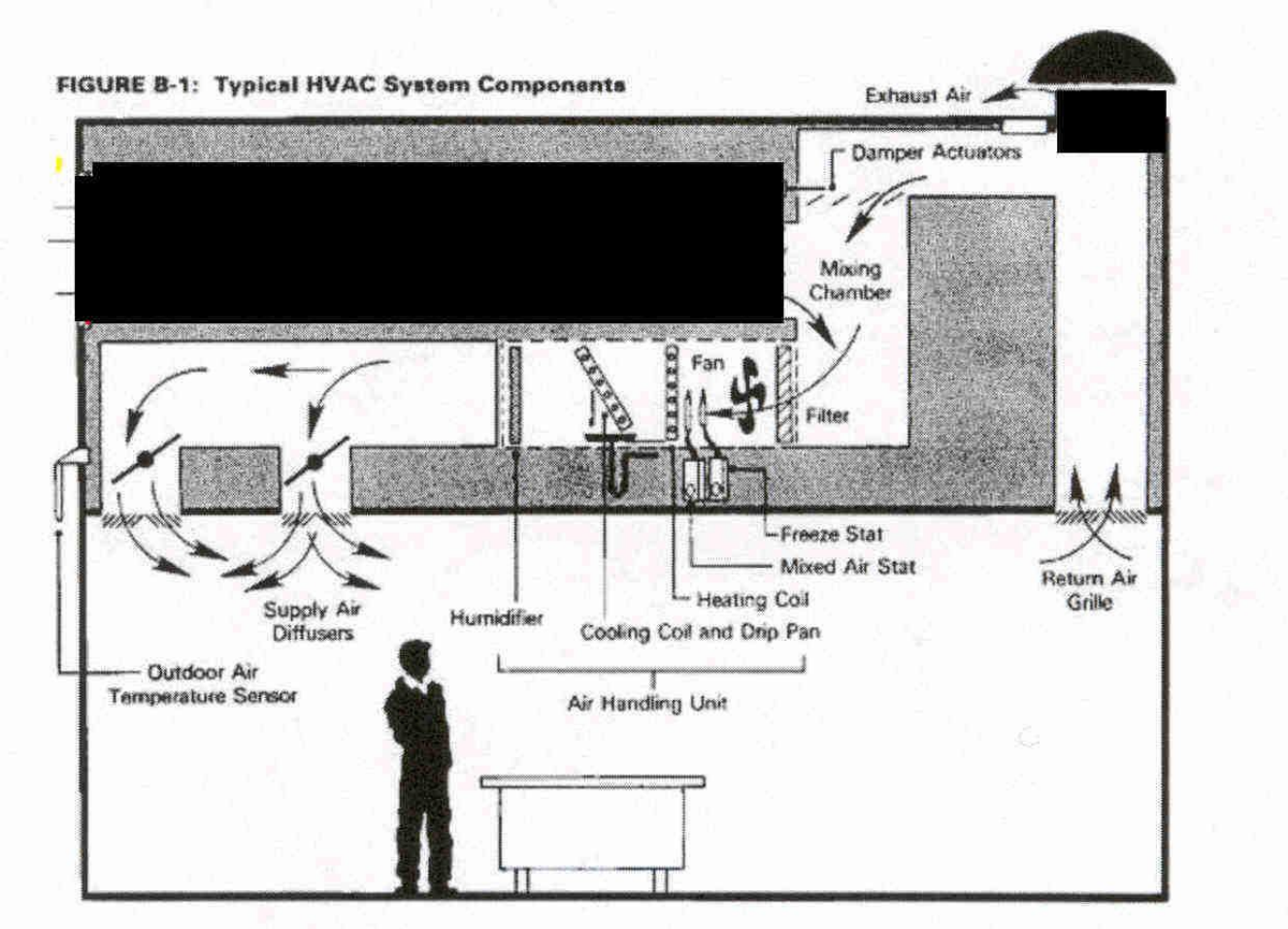
Ideal “EHSRM” Building

100% Outside Air



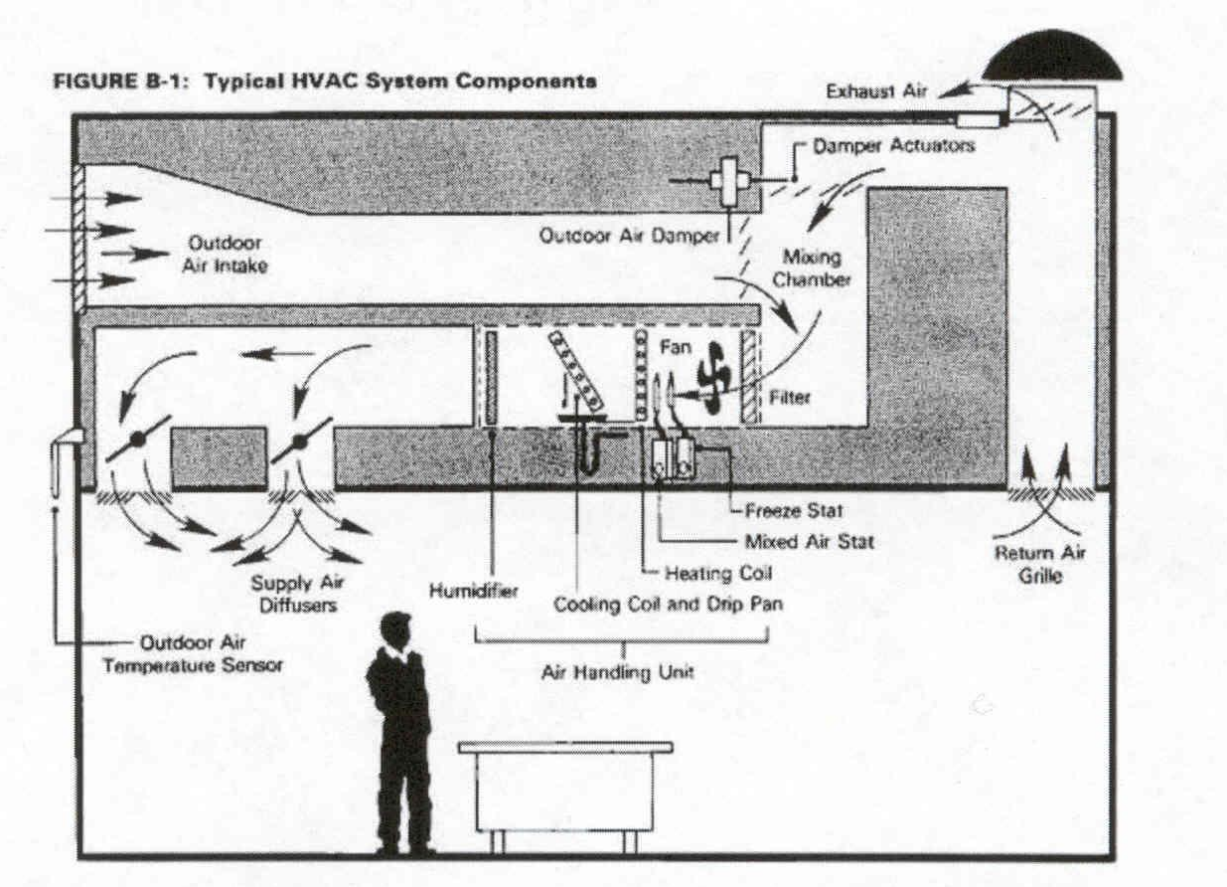
Ideal “Energy Manager” Building

0% Outside Air



ASHRAE Recommendation

20% Outside Air



IAQ Parameters/Guidelines

Parameter	Recommended Limit	Reference
Temperature	73-79 deg F.(summer) 68-74.5 deg F. (winter)	ASHRAE 55
Relative Humidity	**40%-60% RH**	**Florida Depart Man. Ser**
Chemical Agents (VOC)	.64 ppm (3 mg/m^3)	Molhav, 1990
Carbon Dioxide	**650 above ambient**	**ASHRAE 62**
Respirable Particulate	50 mg/m3	State of California
Bio aerosols (Bacteria)	500 CFU/m^3 total	WHO
Bioaerosols (Fungal)	300 CFU/m^3 total 50 CFU/m^3 individual	Robertson , 1997

Outdoor Air Requirements(1)

Type of Location	cfm/person
Office Space	20
Classroom	15
Reception Area	15
Conference Room	20
Laboratory	20
Auditorium	15
Data Entry	20
Library Conference Room	15

(1) Air Dampers set on 20% air outside

Ventilation and Productivity

RATIO OF EMPLOYEE EXPENSE TO OUTSIDE VENTILATION AIR EXPENSE						
Average Annual Salary ($)	Average Annual Salary + 25% Benefits ($)	Average Salary + Benefits/ $/Ft2-Yr *	Annual Expense Outside Air Ventilation Energy**		Ratio of Salary + Benefits/ Outside Ventilation Energy	
			High $/Ft2-Yr	Low $/Ft2-Yr	Low	High
25,000	31,250	217	1.50	0.45	145	482
30,000	37,500	260	1.50	0.45	174	579
36,000	45,000	313	1.50	0.45	208	694
40,000	50,000	347	1.50	0.45	231	772
45,000	56,250	391	1.50	0.45	260	868
50,000	62,500	434	1.50	0.45	289	965
55,000	68,750	477	1.50	0.45	318	1061
60,000	75,000	521	1.50	0.45	347	1157
65,000	81,250	564	1.50	0.45	376	1254

* based on 1 employee/144 Ft2

** based on U.S. Air Force Weather Data and range of U.S. gas and electric expense

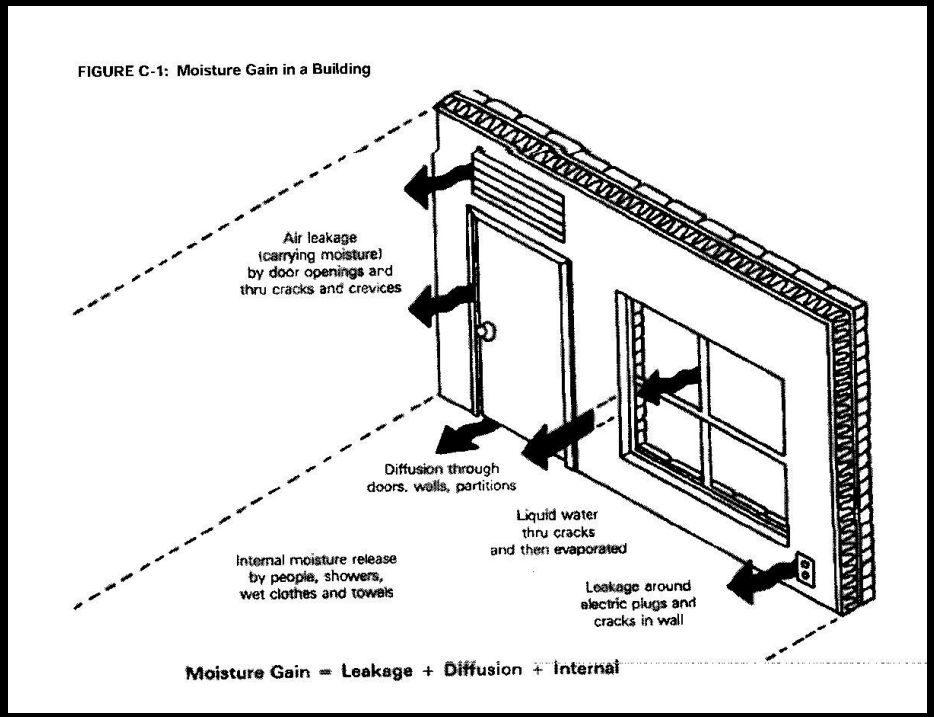
Building Contaminants - Renovations

- Renovations are one of the most troubling sources of contaminants, and a major concern among our members.
- Renovations occurring at the same time as people are in place at work can lead to exposures to the by-products of construction such as paint fumes, glues and dust.
- If renovations are not properly conducted, it can lead to additional health complaints of occupants.

MOLD

Principles of Moisture

- The ability of air to hold water decreases as temperature decreases
- Condensation occurs at 100% relative humidity (RH)
- Excessive Moisture caused by :Surface temperature too cool. Moisture levels to high



Factors Necessary for Mold Growth

- Mold spores
- 40 deg F < Temperature < 100 Deg. F
- Nutrient Base
- **Moisture**

Mold Contamination

Ducts

Drywall

Mold Contamination

Insulation

Wallpaper

Mold Contamination

Safety
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Moisture Control

- Maintaining indoor relative humidity below 65% (25 - 60%, if possible).
- Venting moisture-generating appliances, such as dryers, to the outside where possible.
- Venting kitchens (cooking areas) and bathrooms according to local code requirements.
- **Cleaning and drying wet or damp spots as soon as possible, but no more than 48 hours after discovery.**
- Providing adequate drainage around buildings and sloping the ground away from building foundations. Follow all local building codes.
- Pinpointing areas where leaks have occurred, identifying the causes, and taking preventive action to ensure that they do not reoccur.

Moisture Control

- Repairing plumbing leaks and leaks in the building structure as soon as possible.
- Looking for condensation and wet spots. Fix source(s) of moisture incursion problem(s) as soon as possible.
- Preventing moisture from condensing by increasing surface temperature or reducing the moisture level in the air (humidity). To increase surface temperature, insulate or increase air circulation. To reduce the moisture level in the air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).
- Keeping HVAC drip pans clean, flowing properly, and unobstructed.
- Performing regularly scheduled building/ HVAC inspections and maintenance, including filter changes.

Key Points

- Don’t let Occupant Complaints dictate your IAQ program
- When EHSRM learns of the problem , it essentially means two things.
  - The occupants have been ignored
  - The occupants have lost confidence

EVALUATION

Elements of UTRGV's IAQ Management Plan

- **Recognition**
  - Initial walkthrough
    - Occupant Interviews
    - Visual Inspection
    - Sampling for potential contributors to poor IAQ - VOC's, Comfort Parameters, Particulates (not including mold)
- **Evaluation**
  - Team reviews data and decides on control or remediation measures
- **Control**
  - IAQ team implements control, remediation, and preventive measures
- **Re-Evaluation**
  - Clearance sampling and occupant interviews

Ultimate Goal

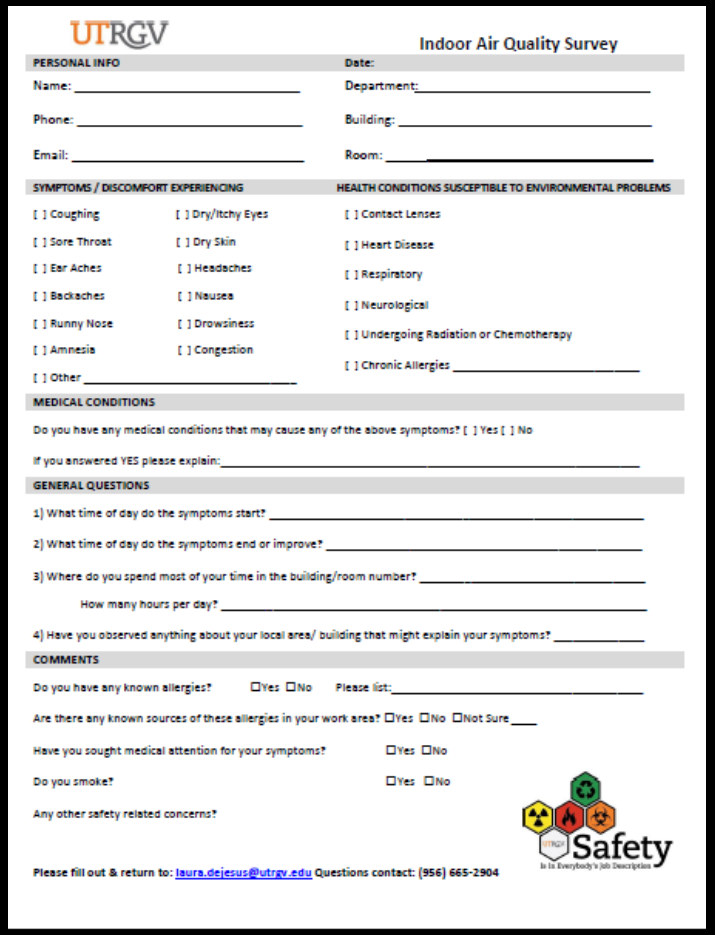
- Completely fixed the water or moisture problem, or HVAC design problem
- Visible mold, mold-damaged materials, and moldy odors should not be present.
- Indoor Air Quality sampling results are within or below criteria limits
- **People should be able to occupy or re-occupy the space without health complaints or physical symptoms.**

Recognition - Initial Walkthrough

- Occupant Surveys
- Visual Inspection
  - HVAC
  - Mold Growth
    - Water Intrusion
    - HVAC Related
  - Musty smell
- Equipment
  - Boroscope
  - Moisture meter

Occupant Surveys

- An effective way to evaluate the environmental conditions is to survey the occupants. It is important, however, that the results of the survey be properly interpreted and used.



UTRGV

Indoor Air Quality Survey

PERSONAL INFO

Name: _____ Date:

Phone: _____ Department: _____

Email: _____ Building: _____

Room: _____

SYMPTOMS / DISCOMFORT EXPERIENCING

[ ] Coughing
[ ] Sore Throat
[ ] Ear Aches
[ ] Backaches
[ ] Runny Nose
[ ] Amnesia
[ ] Other _____
[ ] Dry/Itchy Eyes
[ ] Dry Skin
[ ] Headaches
[ ] Nausea
[ ] Drowsiness
[ ] Congestion

HEALTH CONDITIONS SUSCEPTIBLE TO ENVIRONMENTAL PROBLEMS

[ ] Contact Lenses
[ ] Heart Disease
[ ] Respiratory
[ ] Neurological
[ ] Undergoing Radiation or Chemotherapy
[ ] Chronic Allergies _____

MEDICAL CONDITIONS

Do you have any medical conditions that may cause any of the above symptoms? [ ] Yes [ ] No

If you answered YES please explain: _____

GENERAL QUESTIONS

1) What time of day do the symptoms start? _____

2) What time of day do the symptoms end or improve? _____

3) Where do you spend most of your time in the building/room number? _____

How many hours per day? _____

4) Have you observed anything about your local area/ building that might explain your symptoms? _____

COMMENTS

Do you have any known allergies? ☐Yes ☐No Please list: _____

Are there any known sources of these allergies in your work area? ☐Yes ☐No ☐Not Sure ___

Have you sought medical attention for your symptoms? ☐Yes ☐No

Do you smoke? ☐Yes ☐No

Any other safety related concerns?

Safety
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Please fill out & return to: laura.dejesus@utrgv.edu Questions contact: (956) 665-2904

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Results of Occupants Surveys

No.	Name	Room	Coughing	Sore Throat	Backaches	Runny Nose	Dry/Itchy eyes	Dry Skin	Headaches	Nausea	Drowsiness	Congestion	Contact Lenses	Respiratory	Constant sneezing	Known Allergies		Sought medical attention	Comments	Hours spent in building / office
1	M. Gonzalez	3.2102				✓								✓	✓	No			Suspect spots on carpet	10
2	Pournik	3.216	✓													No				
3	A. Salinas	3.222	✓	✓		✓	✓	✓				✓	✓			No			Dirty carpet & air filters	8
4	L. Leal	3.222	✓	✓		✓	✓									No		✓	Very old carpets	5
5	E. Rodriguez	3.224	✓			✓	✓		✓			✓		✓	✓	No			dirt/dust carpet	
6	H. Moya	3.228					✓			✓						No			permanent smell of old carpet. Kitchen/carpet mold	6-12 hours
7	J. Ramons	3.236														No			No additional Comments	4
8	M. Alcoutlabi	3.238	✓			✓			✓			✓				Yes			Allergy to pollen and dust	8
9	R. Jones	3.246	✓			✓						✓		✓		Yes			certain classrooms bring on coughing. Runny nose and congestion in office. Mold, Pollen, Dust - Allergies & Asthama	6 office 2 class
10	Y. Choi	3.248														No			No additional Comments	
11	J. Li	3.250		✓		✓	✓	✓	✓			✓		✓		No			Mold on Carpet	8
12	M. Ayati	3.251														No			Building temperature is too cold..	
13	A. Fuentes	3.256	✓				✓									No			old carpet	9-10 hours
14	D. Timmer	3.258	✓	✓	✓	✓	✓	✓	✓		✓	✓				Yes		✓	Asthma. Allergies: Oak Crabgrass, mold. Observed mold in breakroom. Old carpet	8
15	H. Vasquez	3.260	✓	✓												Yes		✓	Asthma. Dust & Strong odors. Smelly men's restroom area.	8 - 10 hours
16	A. Figueroa	3.264														No			No additional Comments	
17	A. Srivastava	3.266														No			No additional Comments	4 - 6 hours
18	L. Moreno	3.295	✓	✓		✓						✓		✓				✓	Sinus and asthma. Has had > 8 bouts of an asthma attack combined with Browncitis. Three landed him in the ER.	8
19	R. Nambiar	3.224B				✓		✓								Yes			Dust/Mold. Suspect mold black spots	8

Sampling for Contributors to Poor IAQ

- Comfort parameters
  - Temperature
  - relative humidity
  - $CO^{2,}$
  - CO
- Chemical agents (VOC's)
- Particulates
- **Bioaerosols (mold)**

Handheld Instrumentation for Assessment of Particulates, VOC's , Comfort Parameters

Particulate Counter

Volatile Organic Compounds

Temperature, Relative Humidity, Carbon Dioxide

IAQ Parameters/Guidelines

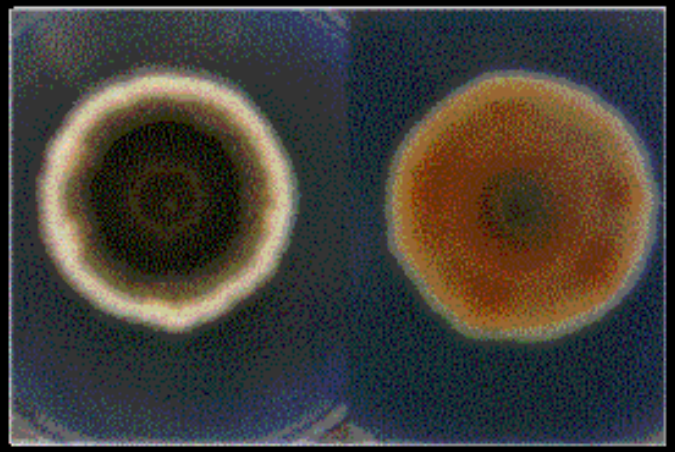
Parameter	Recommended Limit	Reference
Temperature	73-79 deg F.(summer) 68-74.5 deg F. (winter)	ASHRAE 55
Relative Humidity	**40%-60% RH**	**Florida Depart Man. Ser**
Chemical Agents (VOC)	.64 ppm (3 mg/m^3)	Molhav, 1990
Carbon Dioxide	**650 above ambient**	**ASHRAE 62**
Respirable Particulate	50 mg/m3	State of California
Bio aerosols (Bacteria)	500 CFU/m^3 total	WHO
Bioaerosols (Fungal)	300 CFU/m^3 total 50 CFU/m^3 individual	Robertson , 1997

Bioaerosols

- Living Organisms
  - Viruses
  - Bacteria
  - Fungi
    - **Mold**
    - **Mildew**

Common Fungi

Aspergillus

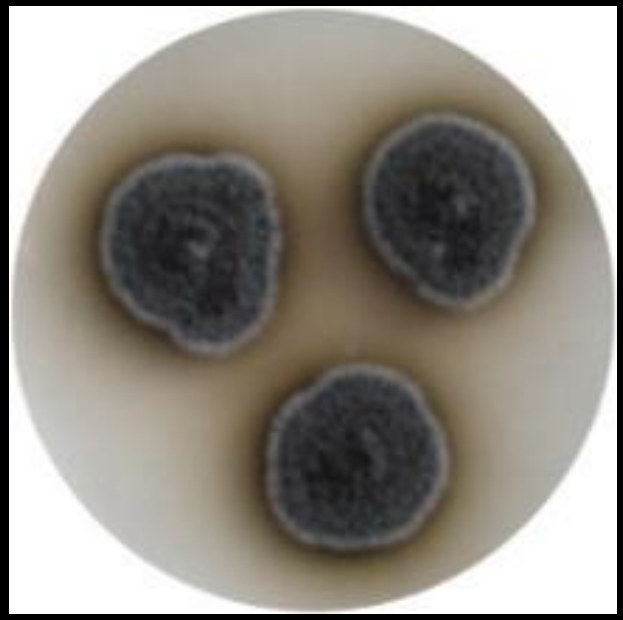


Penicillium

Common Fungi

Chaetonium

Stachybotrus

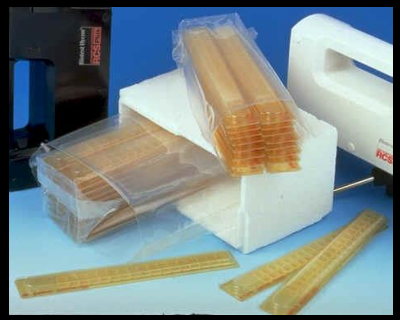


Mold Spores can Contain Toxins

- Some fungi produce toxic metabolites (mycotoxins),
- Almost all molds that grow in the built environment can produce triple helical glucan, both of which are toxic to lung cells.
- Studies demonstrate that very low exposures of these compounds can result in inflammation.
- Studies consistently show increased asthma among occupants of damp buildings not associated with atopy.

Bioaerosols

- Source Sampling
  - Bulk, Swab, Plates
- Air Sampling
  - RCS Sampler, Anderson.
  - Air O Cell

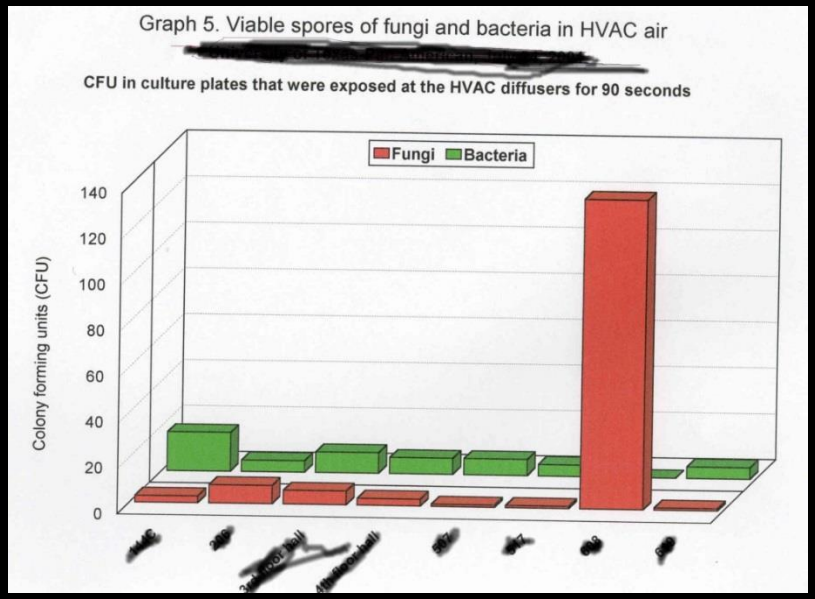


Interpretation

- Indoor vs outdoor
- Complaint vs – non –complaint areas
  - Species
  - Concentrations
  - Comparison to background levels

Sampling Results

- VOC's, Particulates, Comfort Parameters
  - Comparison to established standards or recommendation
- Bioaresols
  - Comparison to established recommendations
  - Presence of mold species inside but not outside?
  - Order of magnitude differences in inside vs. outside?



Control Strategies

Control Strategies – Preventive Maintenance

- Established IAQ parameters for Physical Plant staff to adhere to
- Stress building as a whole as opposed to individual systems
- Incorporated IAQ training (including mold awareness) into PP training schedule
- Beef up HVAC inspections and maintenance
- Incorporate IAQ into the design phase of the project
  - CO_2 and RH sensors into EMS system
  - **Don't rely on compartmentalization**

The Front Line

- Moisture issues are best addressed by those on the front line:
  - Custodians
  - Preventive Maintenance
- A mechanism should be in place where those on the front line can easily report a water leak or evidence of mold .

Control Strategies

- **UVC Light Technology** (5 bldgs)
  - Effective if biological growth is on the coils
  - Cleaner coils also result in decreased energy costs
- **Ozonator (1 bldg)**
  - NIOSH ; OSHA guidelines and standards for indoor air

Control Strategies

- **Duct Cleaning** (4)
  - Maintain negative air pressure
  - Use registered biocides only
- **Filtration** (8 buildings)
- Coil Cleaning

Control – Cleaning Solutions

- Alternative to Remediation
- Mold cleaner and Inhibitor
- Applied directly or with fogger
- Clean registers and diffusers
  - 60% of complaints contributed to visual sight of mold
  - May induce physiological and immunological response

Control Strategies - Spot Treatment

Dehumidifier

HEPA Filtration

Mold Remediation

- All persons engaged in mold-related activities must be licensed, registered or accredited as outlined in this subchapter, except that those professionals currently licensed by the state in another field (including, but not limited to, medicine, architecture, or engineering) who provide to a mold licensee only consultation related to that other field are not required to be separately licensed under this subchapter.
  - Mold Assessment Technician
  - Mold Assessment Consultant
  - Mold Assessment Company
  - Mold Remediation Workers
  - Mold Remediation Contractor
  - Mold Remediation Company
    Mold Analysis Laboratory

Exceptions

- Minimum area exemption. A person is not required to be licensed under this subchapter to perform mold remediation in an area in which the mold contamination for the project affects a total surface area of less than 25 contiguous square feet.
- (1) the following activities when not conducted for the purpose of mold assessment or mold remediation: (A) routine cleaning;
  - (B) the diagnosis, repair, cleaning, or replacement of plumbing, heating, ventilation, air conditioning, electrical, or air duct systems or appliances;
  - (C) commercial or residential real estate inspections; and
  - (D) the incidental discovery or emergency containment of potential mold contamination during the conduct or performance of services listed in this subsection. For purposes of this subsection, an emergency exists if a delay in mold remediation services in response to a water damage occurrence would increase mold contamination;
- (2) the repair, replacement, or cleaning of construction materials during the building phase of the construction of a structure;
- (3) the standard performance of custodial activities for, preventive maintenance of, and the routine assessment of property owned or operated by a governmental entity; or (4) a pest control inspection conducted by a person regulated under the Texas Occupations Code, Chapter 1951 (relating to Structural Pest Control).

Communications

- Communicate to customers when hvac is down .
- HVAC will be down for a few days – their will be no heating – wear a coat
- HVAC will be down for a few days – it will be hot.

Results

- Improved the IAQ on campus
- Established “Standard of Care”
- Increased awareness “I knew something was wrong, I just didn’t know what it was”
- Put EHSRM staff in the face of the traditional “non-hazardous” customers.

References

- US EPA
  - Building Indoor Air Quality – A Guide for Building Owners and Facility Managers
  - Indoor Air Quality Tools for Schools – Managing Asthma in the School Environment
  - Mold Remediation is School and Commercial Buildings
- Texas
  - Voluntary Guidelines for Indoor Air Quality in Schools (25 TAC 297.1-297.6)
  - Voluntary Guidelines for Indoor Air Quality in Government Buildings (SB 860 2008 effective 9/01/01)