

Indoor Air Quality & Mold Class

Spring 2012 Building Monitors Meeting

Presentation Agenda

IAQ - indoor ventilation

- Air contaminants

Molds

- Requirements for growth
- Health effects
- Mold prevention - moisture
- EH&S mold checks & removal
- Summary Recommendations

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Modern ventilation & IAQ

- Office / Classroom type environment (most IAQ problems)
- Most ventilation is forced-air type
- Ventilation is general dilution type
 - Heating, Ventilating, and Air Conditioning (HVAC) System
 - Windows (older buildings)



Energy Efficiency

- Starting in the 1970's buildings were sealed to reduce energy costs
 - Air contaminants trapped
 - Lack of outdoor air
 - Tightly sealed = poor air quality
- American Society of Heating, Refrigeration & Air-Conditioning Engineers (ASHRAE) Standard
 - 15 to 20 Cubic Feet per Minute (CFM) outdoor air per person

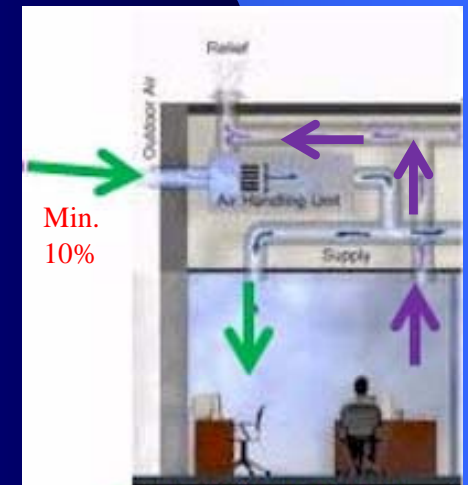




Ventilation in Campus Buildings

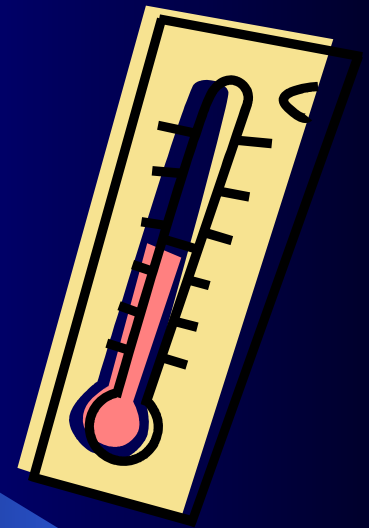


- Chemistry Building – 1950, 1965, 1995's
 - 100% outdoor make up air
 - No indoor air is re-circulated
- Hadley Hall
 - Primarily fan coil heating & cooling,
 - window air dilution, minor forced air
- Thomas & Brown
 - Min. 10% outside air
 - Depending on in & outdoor temp. up to 40% can be make-up air



Causes of IAQ Problems

- Temperature and/or Humidity
- Inadequate fresh air - Leads to Carbon Dioxide (CO₂) buildup (examples: UTEP Union remodel; also O'Donnel Hall – specific rooms/dampers)



CO₂

- Outdoor CO₂ levels ~350 ppm
- Indoor CO₂ Levels 600-1000 ppm
- >1000 ppm CO₂ >> tired/sleepiness



Typical building limit for CO₂ is 5000 ppm

Other Causes of IAQ Problems

Chemicals & Contaminants in buildings

- Building Remodeling - Adhesives, Paints

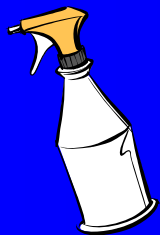


- EH&S policy limits chemicals use in general office/classroom buildings.

- special ventilation or schedule work on weekends or after hours. Poss. need to relocate employees (Dove Hall fire cleanup)



- Cleaners (Branson Library example)



- Personal Hygiene Products

- Perfumes, Deodorants, Cologne



Other Causes of IAQ Problems

Chemicals & Contaminants

- Air Cleaners - some generate ozone
 - Affect existing respiratory problems



- Printers/Copying Machines

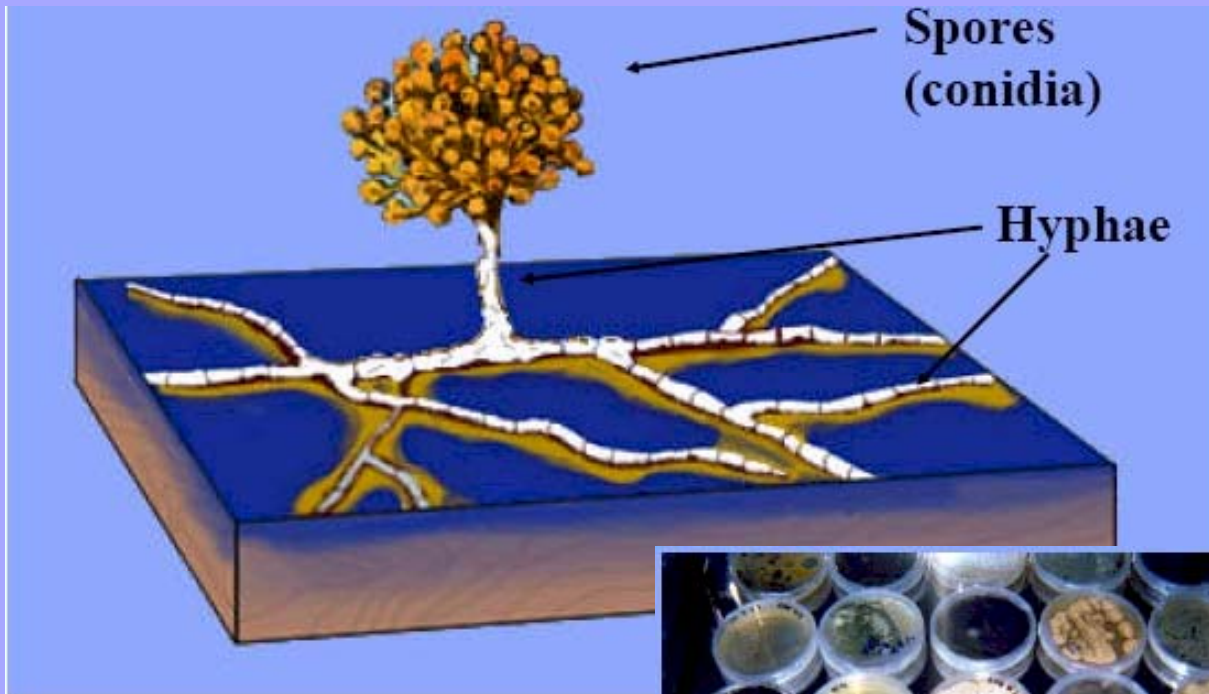
- Particulates & ozone – eye & lung irritations
- Printer study: Ozone <0.001 ppm to 0.016 ppm
- Problematic w/poor ventilation (ex. Breland)



- Water Leaks/Water Damage

- Mold or Mildew (recent concerns / news)

What is mold?



Molds are fungi with multi-cellular filaments called hyphae.

Reproduce through spores.
Airborne dispersal.
Cling to clothing.
Survive temp. extremes.



- Mold growth is commonly green, white, brown or black but can also be seen in other colors.
- It can also change color as it ages.

Mold & Mold Spore Exposure

- Mold & fungi - found virtually everywhere, over 1.5 million fungi species (~72,000 described)
- Mold spores are extremely small & become airborne. Daily exposed to mold spores in air.
- Exposure occurs by breathing, ingestion, & skin contact.

<u>Particle</u>	<u>Size(microns)</u>
Beach Sand	100 - 10000
Dust Mites	100 - 300
Human Hair	60 - 600
Saw Dust	30 - 600
Pollens	10 - 1000
Mold Spores	10 - 30
Red Blood Cells	5 - 10



Requirements for Mold Growth

1. **Moisture** and/or high relative humidity (>60%)
2. Temperature above 40 – below 100 °F
3. Organic matter (ceiling tile, wall board, paper, soiled carpet, etc)
4. Source of spores



Moisture:
a key factor
for most mold

Health Effects with Mold Exposure



- Allergic reaction is most common mold effect. Commonly confused with pollen & dust allergies
- Can cause a variety of health risks dependent on type & amount of mold, and susceptibility & sensitivity of person.
- Many will have no reaction to mold exposure.
- Those with health conditions are more sensitive to mold exposure.

Who is most affected by mold?

People affected sooner & more severely :

- Babies and children
- Elderly persons
- Those with chronic respiratory conditions,
 - extreme allergies
 - Asthma
- Weakened immune systems
(people with HIV, AIDS, receiving chemotherapy, or organ transplant recipients)



Few molds are worse than others.

- Mycotoxins produced by some "toxic molds"
 - historical problem to farmers & animal husbandry in eastern Europe countries.
 - harmful when inhaled, ingested or contact human skin. Rare illness.
- General practice for indoor molds to be treated the same, to be is removed promptly, no matter what mold types



Primary molds of concern (Mycotoxin)

- **Aspergillus Penicillium** (some strains) very common in air & dust indoors (even at low humidity).
 - if higher levels indoors, likely water intrusion
- **Chaetomium** (poss. mycotoxin) both outside & indoors. Indoors on wet sheetrock & other materials
- **Fusarium** (poss. mycotoxin) needs very wet conditions
- **Stachybotrys** (some strains may produce mycotoxins) Not an uncommon mold. Very slick, high water needs.



Penicillium on an orange



EH&S – IAQ/Mold Investigation

- Detective, Scientist & Public Relations
- Many hats



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“Environmental Health & Safety” Professional

The image features the word "MOMIA" in large, 3D, white block letters with a slight shadow. A bright blue beam of light originates from the right side and points towards the letters. The background is a gradient of blue, with a darker blue curved shape on the right side.

MOMIA

NMSU Examples

Ceiling leak example 2010

Ceiling tile, Not just stains,
but dark discoloration.

Generally indicate continued
wet conditions. Ideal for mold.
EH&S wasn't notified in 2010.



Ceiling leak example cont'd 2012

Ceiling tile replaced in 2010
but new staining & discoloration.

EH&S checked, met with
occupants, & arranged detailed
Investigation with FS shops



Ceiling leak cont'd 2012

EH&S identified multiple sources as

- un-insulated AC components (primary problem),
- some from leaky windows &
- some from roof & 3rd floor drains



Water dripping
from
un-insulated
pipes

Window leak example

June 2011

Upon initial check, EH&S found bubbling & peeling of vinyl wallpaper under windows. (photo shows general room view)



Window leak example cont'd

June 2011

EH&S noted no mold on wall surface but reported often damp.

- Further peeling noted much staining and mold under vinyl wallpaper. (photo shows mold under wall cover)



Window leak example cont'd

June 2011

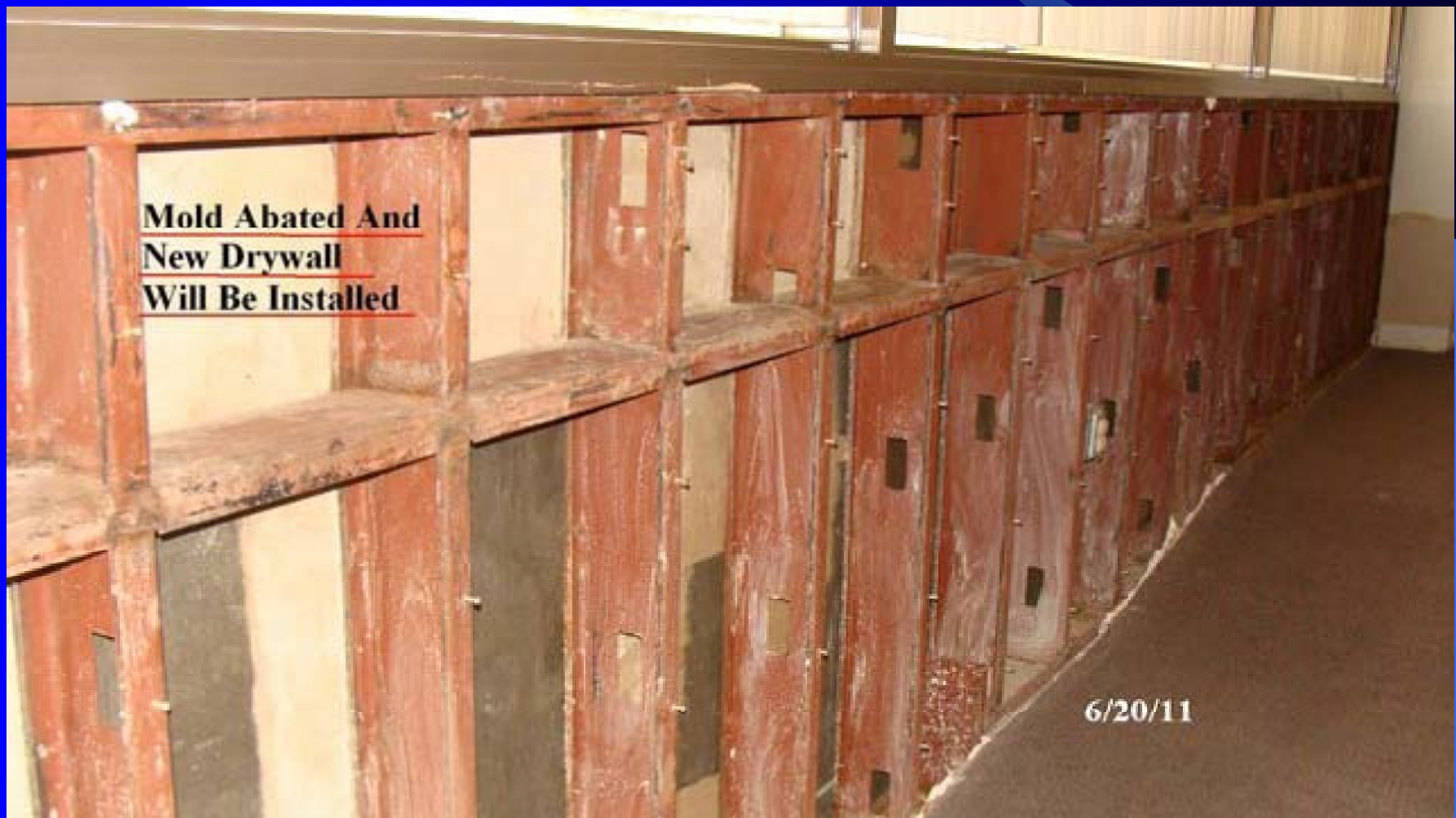
EH&S determined cause

- to be leaky windows insulation allowing water to seep under vinyl wall cover (photo show missing seal)



Window leak example cont'd June 2011

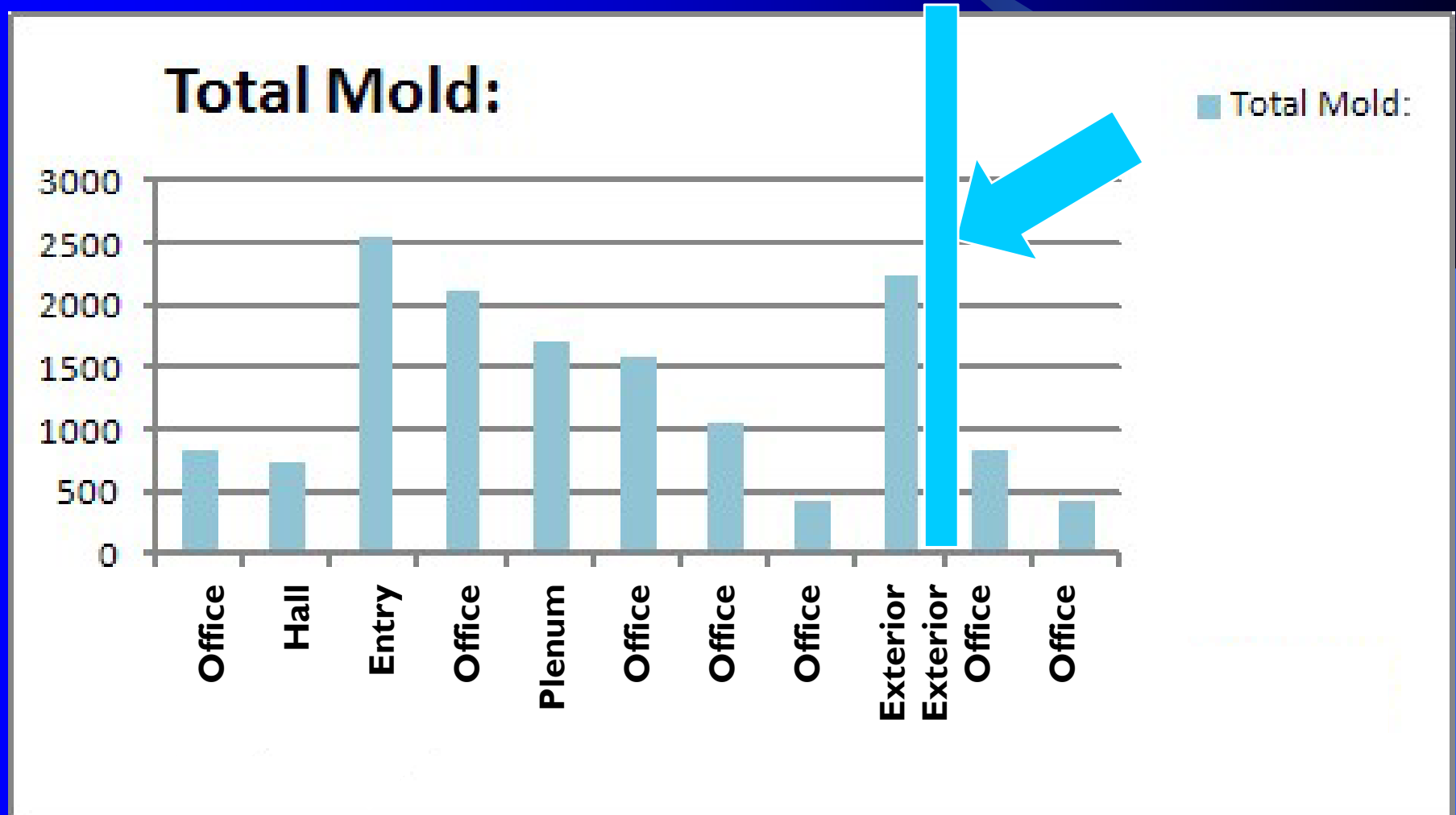
EH&S found moldy wall caused by leaky windows insulation
- remediated/removed dry wall and resealed windows
(photo showing uncover wall cavity)



Air sampling example -

Spring 2012

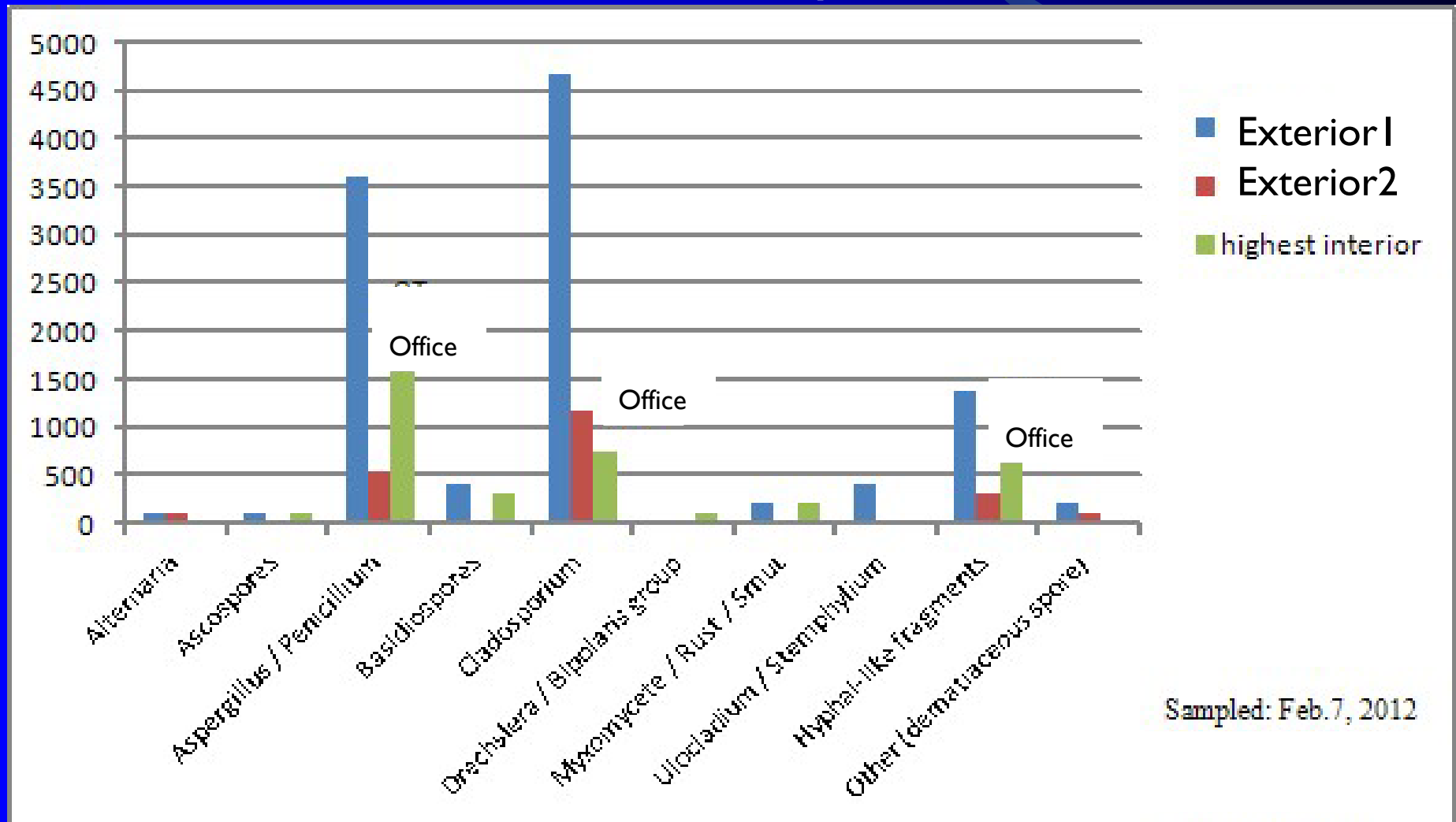
- Performed because leaky roof & expressed concerns
- **Total mold concentrations** showed most inside molds concentrations lower than outside samples



Air sampling example -

Spring 2012

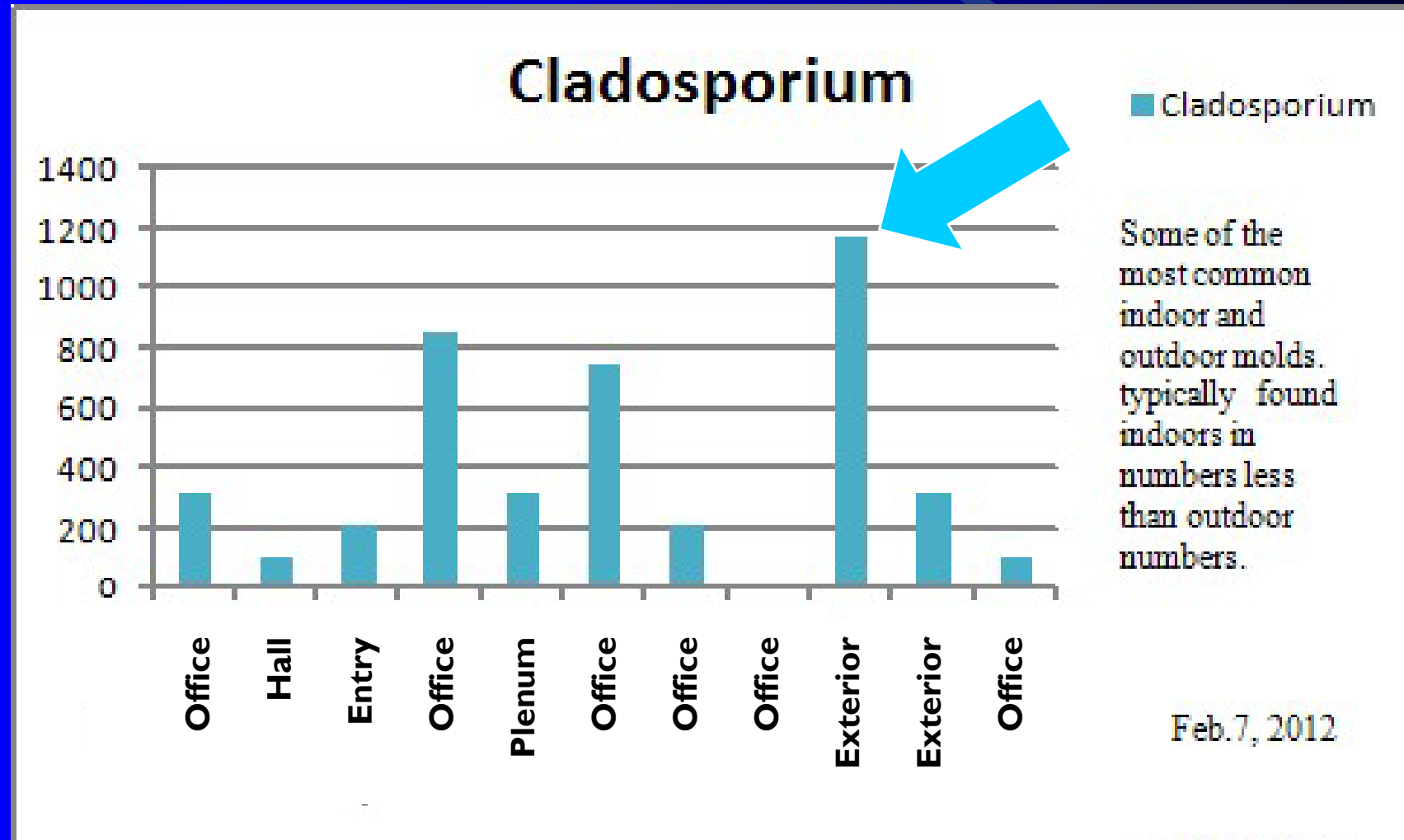
- Performed because leaky roof & expressed concerns
- Review of mold types showed few of concern & at lower concentration compared to exterior



Air sampling example -

Spring 2012

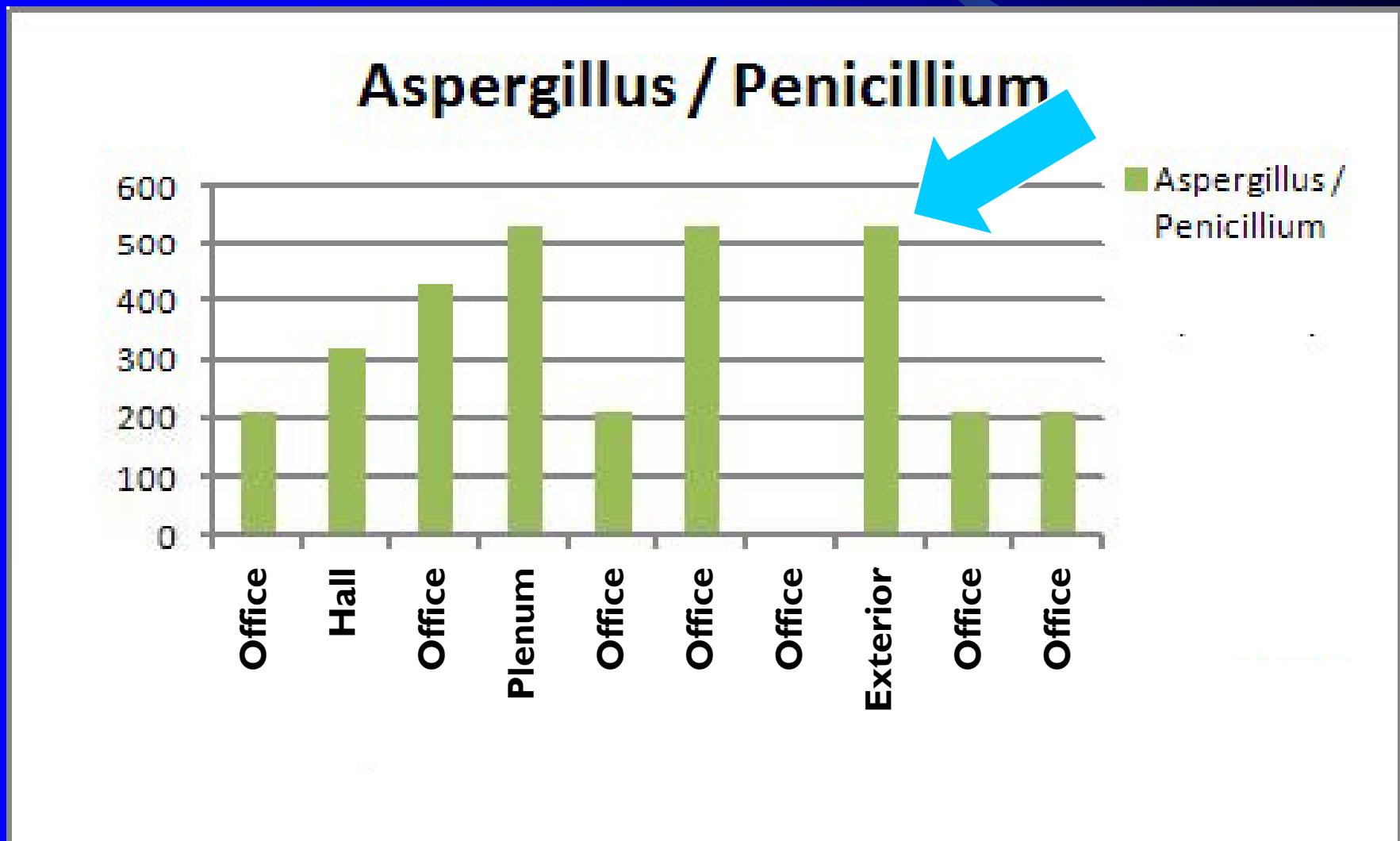
- Performed because of expressed concerns
- Showed inside Cladosporium concentration lower than outside



Air sampling example -

Spring 2012

- Performed because leaky roof & expressed concerns
- Showed inside molds conc. lower inside than outside



Mold Prevention and Water Clean-Up



- Mold needs moisture and food source to grow.
- Keys to mold & fungus prevention:
 - removing moisture and clean-up
 - within 24 - 48 hours.
- When any source of moisture is found, report it to Facilities Services to get the area dried ASAP.



Mold Prevention and Water Clean-Up



- Facilities Services & Other Maintenance Personnel
 - Must locate the source of the moisture and eliminate the causative agent and;
 - Utilize prevention techniques to minimize the potential for mold and fungal growth.
 - Water source is not known EH&S can investigate.

Mold Prevention

What do you do?

Example Scenario

A flood soaked the carpet in one of the ground floor rooms in a building on campus. What do you do?



Mold Prevention

What do you do?



Answer

DRY WITHIN 24 HOURS

- ✓ Remove all material from the carpet.
- ✓ FS to remove the water with a water extraction vacuum.
- ✓ If extensive, arrange to shampoo the carpet
- ✓ Reduce humidity with dehumidifiers and use fans to accelerate the drying process.

EH&S Mold Assessment

- As appropriate EH&S will conduct a mold hazard assessment.
- Visual Inspection
 - The presence of mold, water damage, or musty odors must be addressed immediately, beginning with a visual inspection.
 - Visually checked for damp filters and other damp conditions. Ceiling tiles, walls, cardboard and paper must also be visually inspected for mold growth.
 - Check wall board moisture with meter, possible internal inspection

EH&S Mold Assessment

- Sampling

- Air monitoring is seldom needed or indicative if mold is found.
- Air sampling & analysis is complicated. Mostly to check inside air mold concentrations & to check against mold spores in outdoor air.
- If air monitoring is performed, outdoor air and non-suspect area samples must also be collected for comparative purposes.

Clean-Up and Removal

- Four levels of contamination
 - Level 1: Small Isolated Areas (10 ft² or less)
 - Level 2: Mid-Sized Areas (10 ft² – 100 ft²)
 - Level 3: Large Areas (More than 100 ft²)
 - Level 4: HVAC Contamination



Clean-up and Removal

Level 2: Mid-Sized Areas (10 ft² – 100 ft²)

Level 3: Large Areas (More than 100 ft²)

Level 4: HVAC Contamination

Outside contractors to perform remediation.

1. For I&G areas, EH&S will arrange if needed.
2. Other areas, EH&S will recommend.
3. EH&S is to be consulted prior to any remediation.

Summary

IAQ - indoor ventilation

- Indoor air contaminants

Molds

- Requirements for mold growth
- Health effects associated with mold
- Mold prevention - moisture
- EH&S Mold checks & removal

Questions: call or email

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