

The Building as a Source and Vector of Problematic Microorganisms

Dr. Curt White, ÆGIS Environmental Management

A Webber Training Teleclass



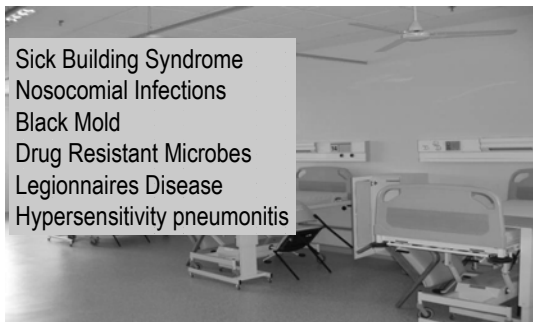
The Building : A Source and Vector of Problematic Microorganisms



W. Curtis White,
ÆGIS Environmental Management

Hosted by Paul Webber
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www.webbertraining.com

Medical Buildings in Crisis



Sick Building Syndrome
Nosocomial Infections
Black Mold
Drug Resistant Microbes
Legionnaires Disease
Hypersensitivity pneumonitis

Medical Buildings - Crisis or Curative

- Insurance Exits
- Legislative Mandates
- Press Events
- Legal Actions
- Deferred maintenance budgets
- Reduced housekeeping staffs

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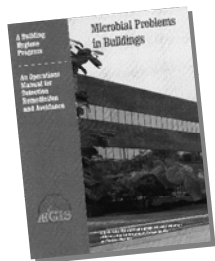
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New Title from Medetex Press



Microbiological Problems in Buildings:
A Building Hygiene Program
An Operations Manual for Detection,
Remediation, and Avoidance
W. Curtis White
Margaret M Wulf

For order information call:
800.241.9186 X 7111
twhitehouse@microbeshield.com

Indoor Environmental Quality

IEQ is...

The balance of environmental conditions in a building that allows for maximum function of the building and comfort, productivity, and well being of the occupants

BUILDINGS

OCCUPANTS



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Buildings

What purpose do they serve?

Human Habitation

- Comfort
- Productivity
- Shelter
- Security
- Healing environment
- Do no harm



Microbes: Impact on Healthcare

Particles and Toxins: Mortality, Morbidity and Discomfort

- Building Utility
- Maintenance Costs
- Staff
- Test Scores
- Lost Time
- Infection Reportables



Indoor Environmental Quality

- Real Costs – Hidden Costs
- Press Events
- Distraction of Resources
- Litigation
- Political Backlash
- Accountability

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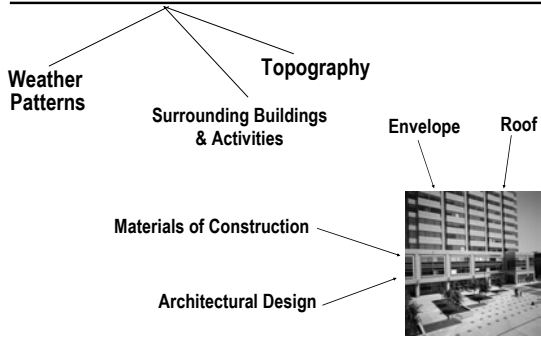
The Building Population

We do not choose!

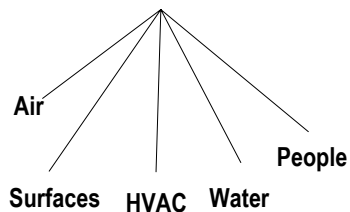
- Asthma
- Respiratory Handicaps
- AIDS
- Immunosuppressed
- Other Communicable Diseases
- At Risk people



Building Exterior



Building Interior

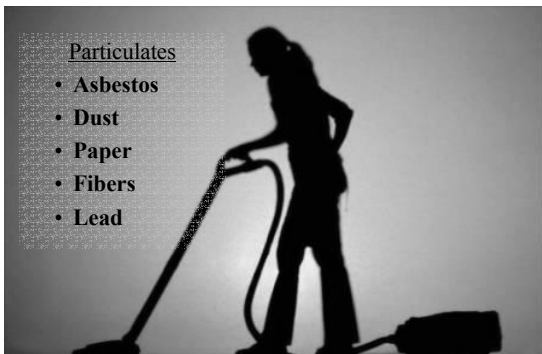


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Types of Indoor Pollutants

- Particulates
- Nuclides
- Volatile Organic Compounds (VOC's)
- Biologicals

Types of Indoor Pollutants



Types of Indoor Pollutants

- Nuclides
- Radon

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Types of Indoor Pollutants

Volatile Organic Compounds (VOC's)

- Carbon Monoxide
- Carbon Dioxide
- Formaldehyde
- Pesticides
- Perfumes
- Air Fresheners
- Scented Candles

Factors Affecting IEQ

“But how do we know when there is a problem?”

- Light
- Humidity
- Temperature
- Ventilation (HVAC)
- Noise
- Occupant Activity



Indoor Pollutant Problems

- Building
- Human
- Business

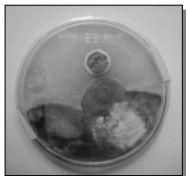
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Types of Indoor Pollutants

Biological - The worst

- Bacteria
- Fungi (mold & mildew)
- Algae
- Exotoxins / Endotoxins
- Pathogenic / Nonpathogenic

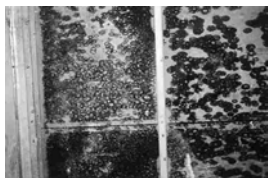


VOC's & Particulates Too!!

Indoor Pollutant Problems

Building Problems

- Odor
- Staining
- Defacement
- Deterioration



Indoor Pollutant Problems

Human Problems

- Fatigue
- Dizziness
- Nausea
- Headaches
- Irritation of eye, nose, and throat
- Drying of mucus membranes and skin



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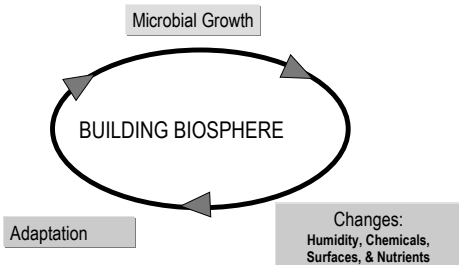
Indoor Pollutant Problems

Business Problems

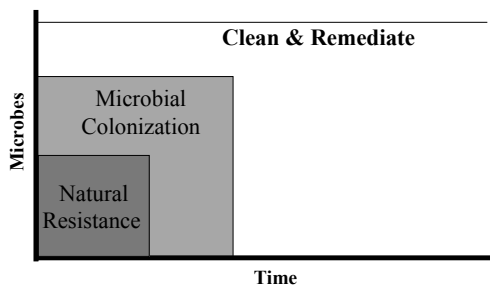
- Occupants Lost
- Insurance Cost
- Sale/Rent Loss
- Productivity Losses
- Workers' Compensation
- Renovation Schedules
- Energy Costs
- Maintenance Costs



Microbes and Their Relationship with Building Interiors



Environmental Succession



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Life Stages of a Building



Causes of Mold & Mildew Growth



Microbes need 4 things to survive:

- FOOD
- TEMPERATURE
- MOISTURE
- RECEPTIVE SURFACES

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Contributing Factors

Building Shell & Structure



Contributing Factors

Operating Systems



Contributing Factors

Appliances & Equipment



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Contributing Factors

Pets & Plants



Contributing Factors

Occupant Habits & Practices



Contributing Factors

Cleaning Procedures



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Contributing Factors

Maintenance Practices



Contributing Factors

Energy Saving Practices



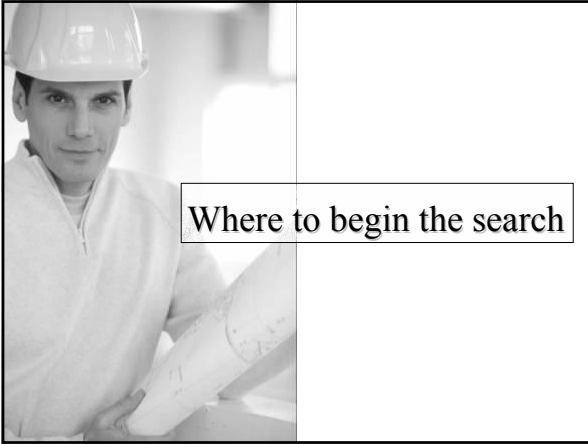
Contributing Factors

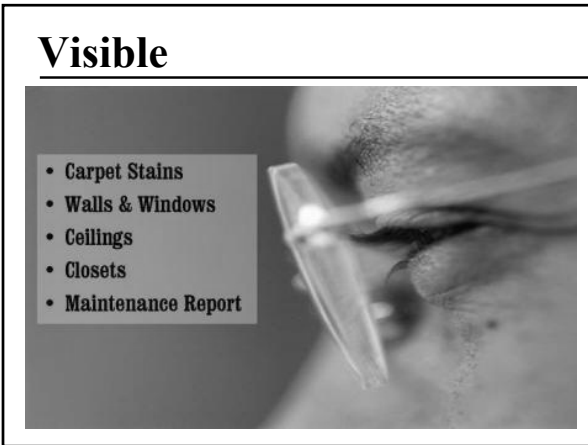
Catastrophic Events

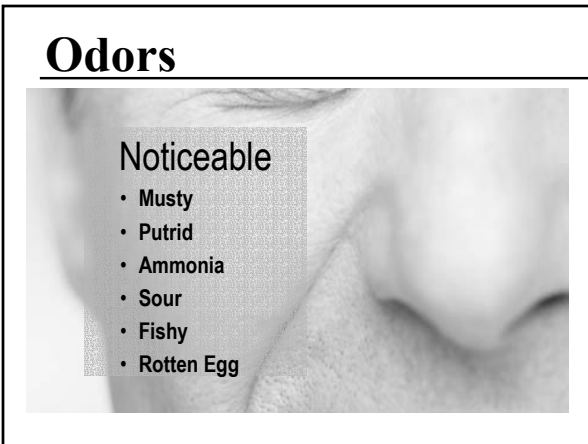


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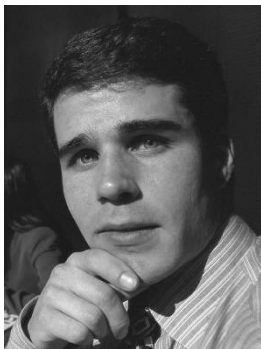
Occupant Complaints

Stains

Odors

Allergy Symptoms

- Itchy Eyes
- Runny Nose
- Tight Chest



Where is the complaint?

- Certain Rooms
- One Side of the Building
- Outlets/Switch Plates
- Door/Window Jams
- Top Floor or Basement/Crawl
- Near Pipe & Electrical Chases
- Near Stairwell or Elevator Shaft
- Ask Maintenance Personnel

When?

- Time of Day
- Time of Week
- Time of Year
- After a rain

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Building History

Moisture Events

- Pipe break/plumbing leak
- Roof Leak
- Flooding
- Condensation Problems

Structural Damage

- Roof or Shell problems
- Cracks

Walk-through Survey



- Layout plan of building
 - ✓ blueprint
 - ✓ fire escape
- General history of building
- History of problem areas
- History of complaints

Where to Look

Zone of complaint

Peripheral areas

- *above*
- *below*
- *around*

Non-problem areas

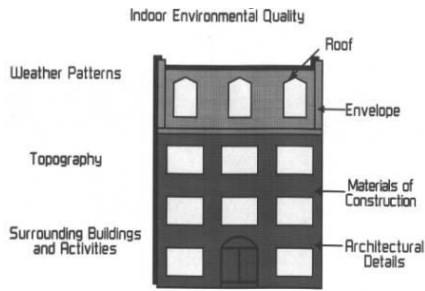


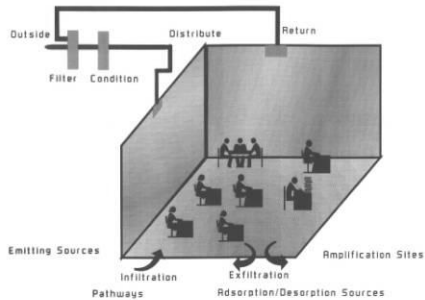
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“Tell Tales” for Problems

Personal Heaters	Blocked Ductwork
Humidifiers	HVAC Zone-control
Air Fresheners	Staining Around Windows
Fans	Water Stains

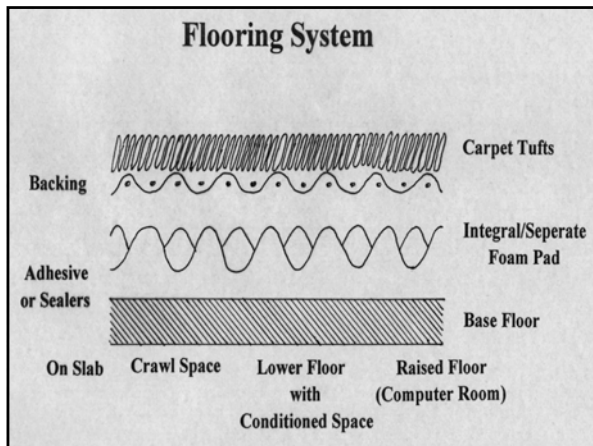


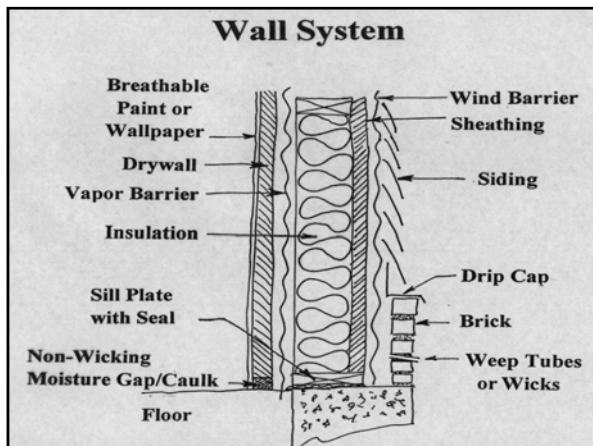


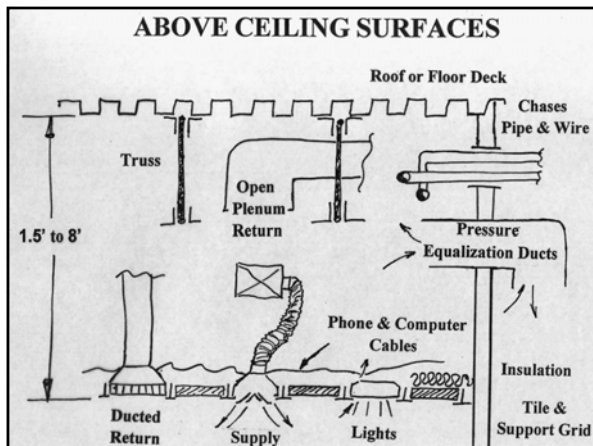
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Cleanup & Control

Scope of Cleanup?

Occupant
Criteria



Owner Criteria

Agreed upon solution

Nature of Problem

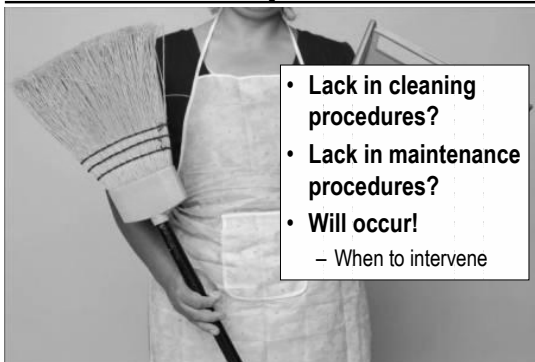
- Natural Buildup?
- Catastrophic?
- Preventative?



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Natural Buildup



- Lack in cleaning procedures?
- Lack in maintenance procedures?
- Will occur!
 - When to intervene

Catastrophic Event



- Contingency Plan
- Shovel & water hose: 99% effective
- Over-the-counter cleaners & disinfectants
 - Mode of action
 - Human risks
 - Building risks
 - Environmental risks

Contingency Plan

- Nature & Size of problem
- Security
- Communications
 - Public & Internal
- Risk Assessment
- Professional Services
 - Pre-qualify with standing P.O. & work release
 - Drying; Decontamination; Physical Restoration
- Protect Peripheral Areas

PROFESSIONAL HELP
VS.
DO IT YOURSELF

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Acceptable Levels of Microbial Exposure

- Permissible Exposure Limits
- Threshold Limit Values
- Least Possible Exposure

ALARA = As Low As Reasonably Achievable

Level of Contamination

- Light
- Medium
- Heavy

Area Involved

- Large
- Medium
- Small

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Location Involved

- Risk of spread
- At-risk populations
- Risk to workers



Different Strategies

General Cleaning
or
Full Containment

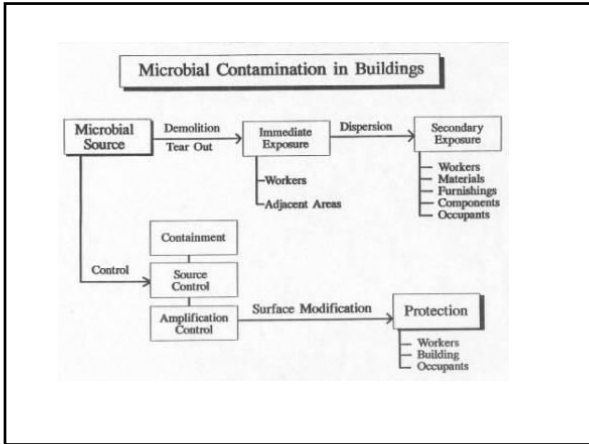
Microorganisms in Buildings

Strategies for Control

- Control Nutrients
- Control Moisture
- Control Sources


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Mitigation


- Isolation
- Containment
- Elimination



Preventative



Areas at risk



After clean-up

New construction

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An Integrated Program

Detection

Analysis

Communication of Standards



Verification
Monitoring
Response

Case Studies



Florida Hospital

Lee County, Florida

The Problem

- Strong Mildew Odor
- Occupant complaints & health concerns
- Visible growth



The Cause

- Roof leaks
- Unconditioned / unoccupied space
- HVAC system problems
- Spotty envelope problems

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**Arthur G. James Cancer
Hospital and Research Institute
Columbus Ohio**



*Improved Control of Microbial
Exposure in Hospitals:
A 30 Month Field Study*

**Arthur G. James Cancer
Hospital and Research Institute
Columbus Ohio**



Background:

- Prior to opening a major water pipe froze and ruptured
- Approximately 500,000 gallons of water flooded the floors below.
- Ceilings, walls, carpeted floors, and furniture were exposed to wet or high humidity conditions

**Arthur G. James Cancer
Hospital and Research Institute
Columbus Ohio**



Post-Event Observations

- Day Seven: facility developing distinct musty odor.
- Week 3: Visible fungal colonies on exposed surfaces and behind vinyl wall coverings.
- Floors below were visibly contaminated as the water damage spread.

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Arthur G. James Cancer Hospital and Research Institute Columbus Ohio

Sampling

- Air sampling retrieved >2800 CFU/CuM on most floors of the facility despite aggressive cleaning and air filtration efforts.



Arthur G. James Cancer Hospital and Research Institute Columbus Ohio

Treatment with Antimicrobial

- Ceilings
- Floors
- Walls
- Wall cavities
- Above ceiling space
- Chases
- Furnishings



Arthur G. James Cancer Hospital and Research Institute Columbus Ohio

Results

- During 7 month renovation retrievals were in the range of 0-25 CFUs/m³.
- One year later, retrievals averaged .08 CFUs/m³.
- 2 years later, retrievals averaged .04 CFUs/m³.



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Sultan Ismail Hospital



Johor, Malaysia

- Tropical Environment
- Building Begun in 1999
- Construction Stopped
- Water Saturation
- Environmental Microbial Contamination

Sultan Ismail Hospital



Johor, Malaysia

- Construction Continues – 2002
- New Materials & New Contamination
- Partial Occupation – July 2004
- People Sick, Pervasive Odors, Visible Growth
- Building Closed – September 25, 2004

Sultan Ismail Hospital

Aspergillus fumigatus Dominant and Pervasive
All Visible & Out of Sight Spaces Contaminated

Total Clean-Up & Antimicrobial Treatment – March 2005 – July 2005

Clearance Testing – No Problems – November 2005

Staged Occupancy Started – No Current Problems – February 2006



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