

Remediation of Fungal Growth on Wood and Wood-based Building Materials: Challenges to the Forest Products Industry

by

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Natural disasters & related destruction ...



Salvage may be possible, but it isn't the focus of this talk.



Childcare center, after Katrina. What to dry, repair, replace?

Drying out construction materials...



For a given wetting event, the damage assessment and remediation team could consist of ...

- 1. Certified Industrial Hygienist (CIH)**
- 2. Remediation (cleaning) 'specialist'**
- 3. Materials / construction expert**



Depending on size of project 'CIH' and/or 'remediation' component likely on site. The most likely to be missing is would be the 'materials' component.

Are products still functional?



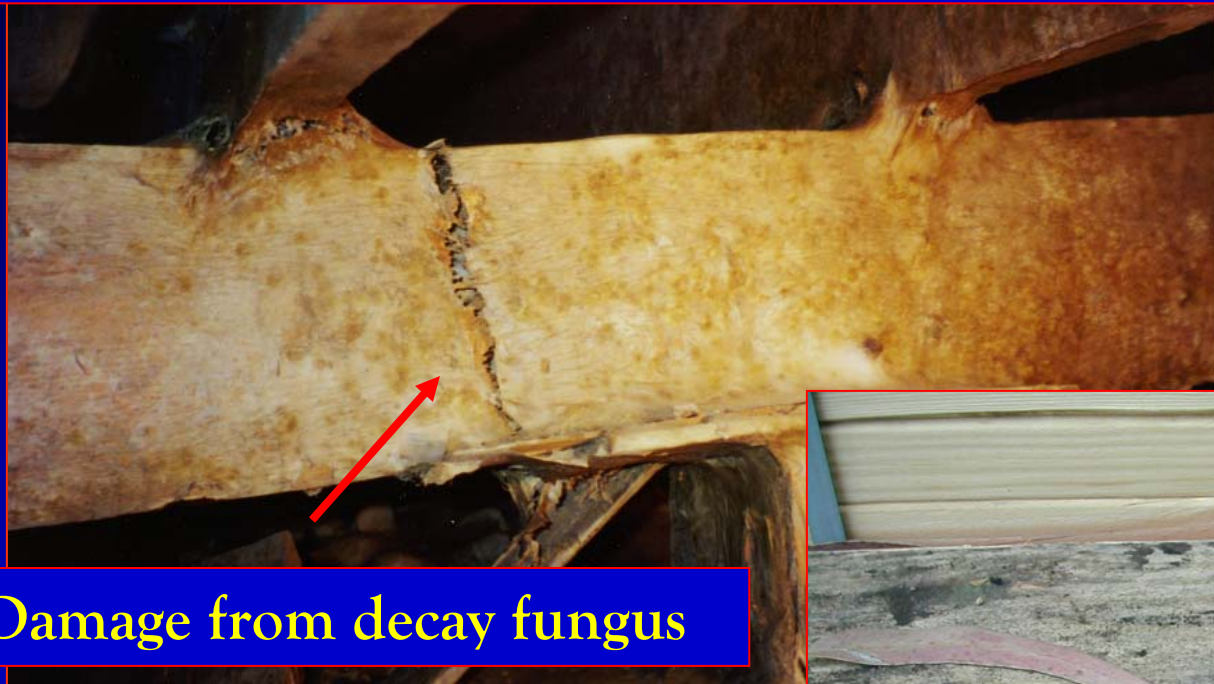
Application of biocide (anti-sapstain chemical) to green lumber is an option, either in an in-line spray ...



... or a dip tank...



One of challenges to industry is common belief that mold and sapstain fungi can structurally degrade wood and wood-based products. 'Mold' used as a generic term for 'fungi'.



Damage from decay fungus



Structural consequence?

Stachybotrys chartarum (atra)



... and what is health risk, or perceived health risk.

“Major issues with existing quantitative standards and guidelines are the lack of connection to human dose/response data, reliance on short term grab samples analyzed by culture, and the absence of standardized protocols for data collection, analysis, and interpretation.”

Carol Y. Rao and Harriet A. Burge, Harvard School of Public Health
John C.S. Chang, US EPA, Air Pollution Prevention and Control Division
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Guidelines on mold remediation not as established as lead and asbestos. Where (mold remediation) rules are vague, interpretation tends to be more extreme (i.e., more expensive)



Construction delay ...

Guidelines for Mold Remediation ...

- New York City
 - EPA
 - IICRC (Institute of Cleaning Restoration and Remediation)
 - IICRC S500 (*Standard and Reference Guide for Professional Water Damage Restoration*)
 - IICRC S520 (*Standard and Reference Guide for Professional Mold Restoration*)
- IICRC – Prepares Guidelines and also certifies mold remediation professionals.

The New York City Guidelines

Organization of Guidelines

- 1.0 Health Issues
- 2.0 *Environmental Assessment*
- 3.0 *Remediation*
- 4.0 Hazard Communication

The New York City Guidelines

3.0 Remediation - Levels

- Level I: Small Isolated Areas (≤ 10 SF)
 - Ceiling tiles and small areas on walls
- Level II: Mid-Sized Isolated Areas (10-30 SF)
 - Individual wallboard panels
- Level III: Large Isolated Areas (30-100 SF)
 - Several wallboard panels
- Level IV: Extensive Contamination (> 100 SF)
 - Contiguous square feet in an area
- Level V: Remediation of HVAC Systems

Depending on the size or extent of mold growth, special precautions, including use of personal protection equipment and constructing small rooms to isolate affected areas, can be taken when removing material.



The Institute of Inspection, Cleaning and Restoration Certification (IICRC) list three categories of water –

- ✓ Clean Water [From a source that won't harm humans. Examples include supply lines to appliances, rainwater, toilet bowls / tanks that don't contain contaminants]**
- ✓ Grey Water [From a source that contains some potential contaminants. Examples include water from a dishwasher and washing machine. Water from toilet bowls containing some urine would also be included in this category.]**
- ✓ Black Water [Water containing sewage and other contaminants. This would include all forms of water from flooding – seawater, rivers, streams, etc.]**

Standard for Professional Water Damage Restoration

Monitoring

- It is highly recommended that technicians establish a moisture content or drying goal for affected building materials and contents.
- Monitoring procedures may include temperature and humidity readings, updating progress reports and checking moisture content of structural wood and other materials with a moisture meter.

Moisture meters used to map wet areas



Use of a floor fan to dry materials...

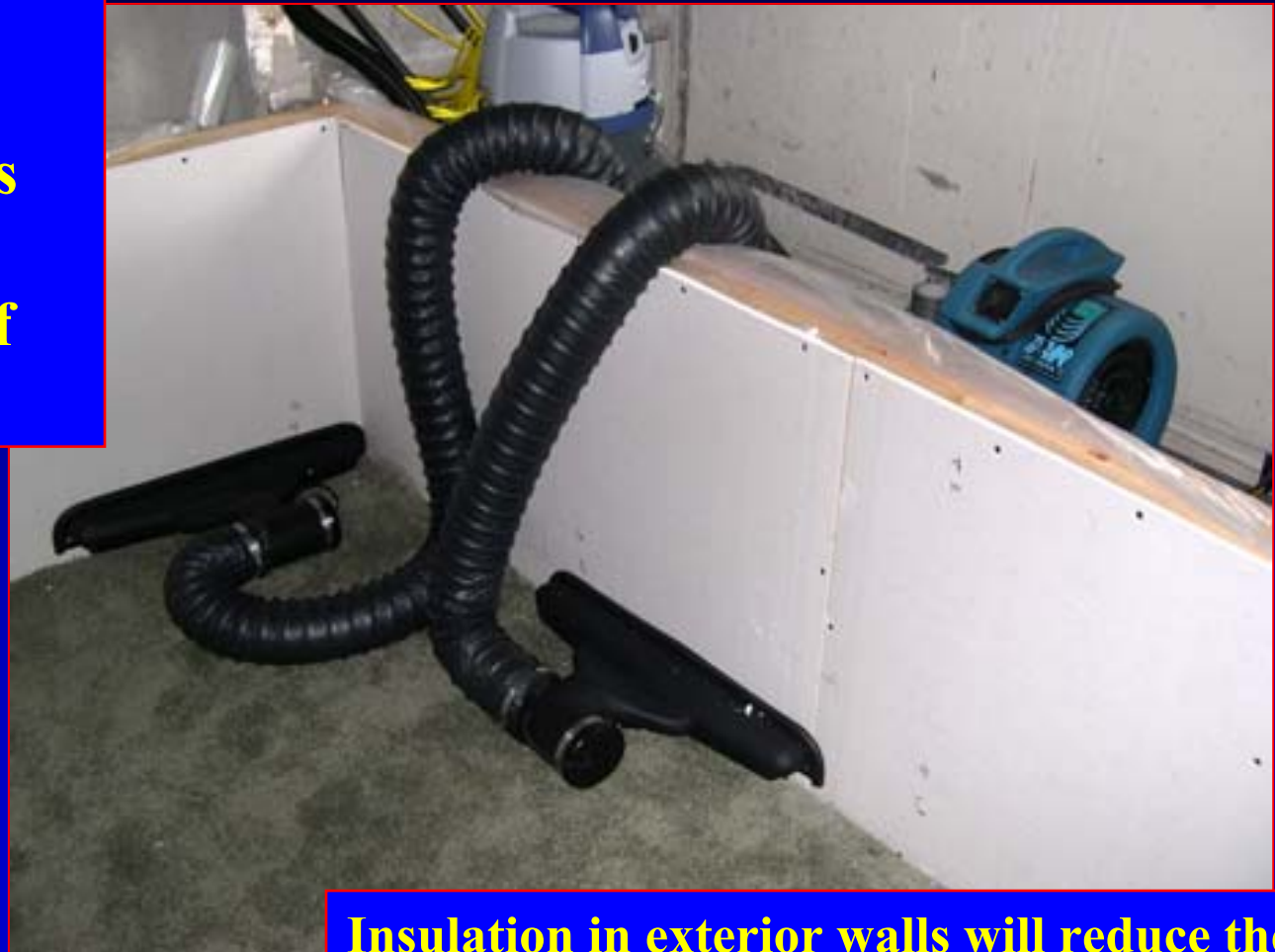
Floor fans, used as a *'first response'* tool (24 – 48 hrs after event) to accelerate the drying of wetted carpet and floor sheathing.

After 48 hrs fan will effectively *disperse* the mold spores throughout the room.



Use of a floor fan to dry out a wall cavity

The black ducting is connected to a floor fan. Air is being injected into the base of the wall.



Insulation in exterior walls will reduce the effectiveness of this procedure.

Containment and drying out using fans



Four foot strip of wallboard removed at base. Facilitates drying & easier to replace.

Damage from 'ice-blasting' to wetted OSB
(some decay damage)



Potential use of encapsulant (e.g.,
Fosters, Anabec)

Rain entered structure through unfinished roof.



Water flow down walls, wetting insulation and gypsum wallboard.



- Flood occurred on Saturday, December 6, 2003 at 7:50 pm.
- The source of the water was a hot water line that broke in the plenum on the first floor of the building.
- Approximately 6,000 – 9,000 gallons of hot water escaped.

Temperature control to minimize mold growth



Standard for Professional Water Damage Restoration

Third-Party Evaluation of Remediation

In some water loss situations:

- Where there is microbial contamination that can adversely affect worker or occupant health;
- Where there are high risk occupants in the structure; and
- Where a public health issue exists (e.g., elderly care or child care facility, public buildings).



Zeflon air sample,
collecting non-viable
spores. Cannot
identify to species
level.

“Existing quantitative standards/guidelines for fungi in indoor air issued by governmental agencies are **based primarily on baseline data** (rather than health effects data), and are either absolute (numerical) or relative (indoor/outdoor comparisons) or a combination of the two.”

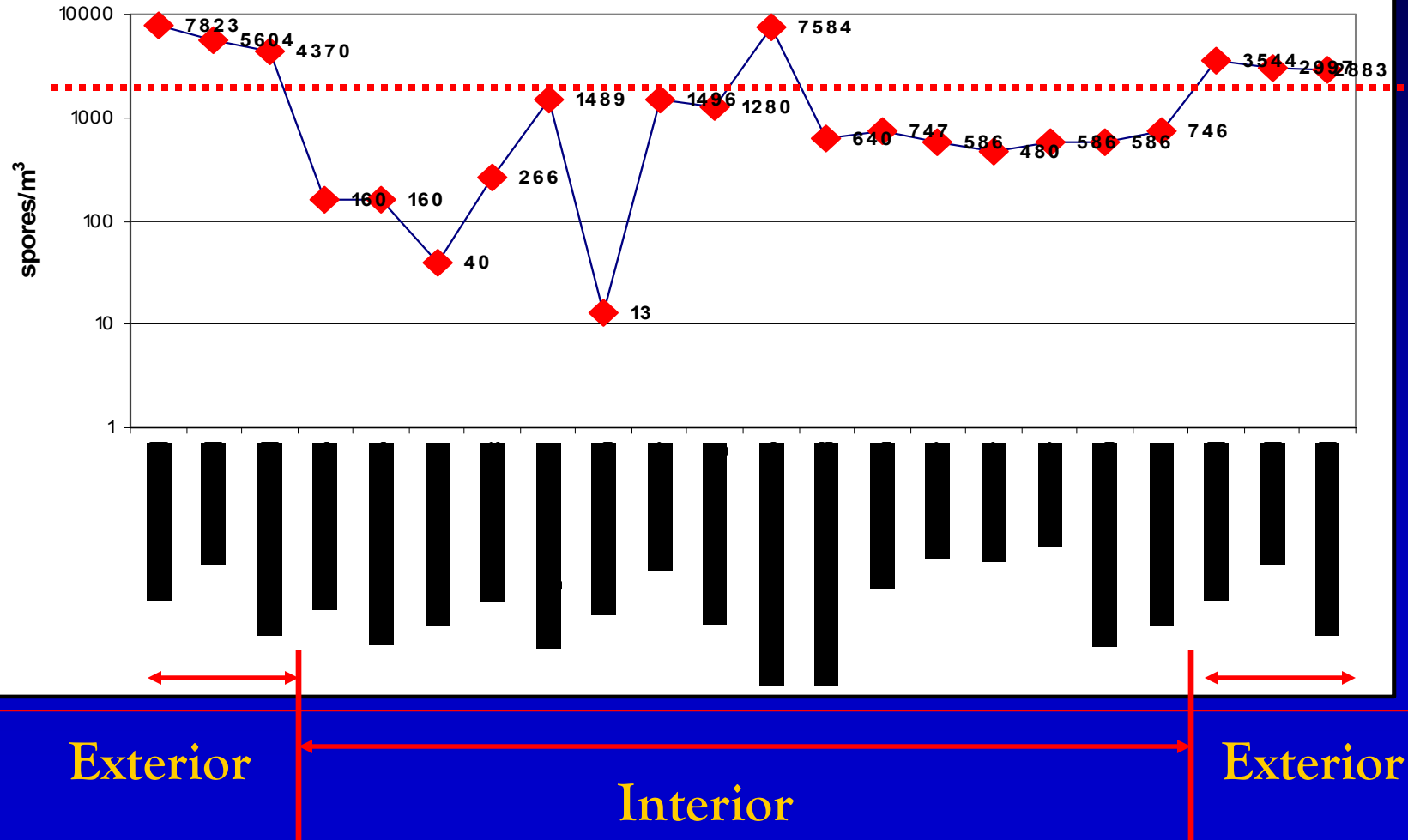
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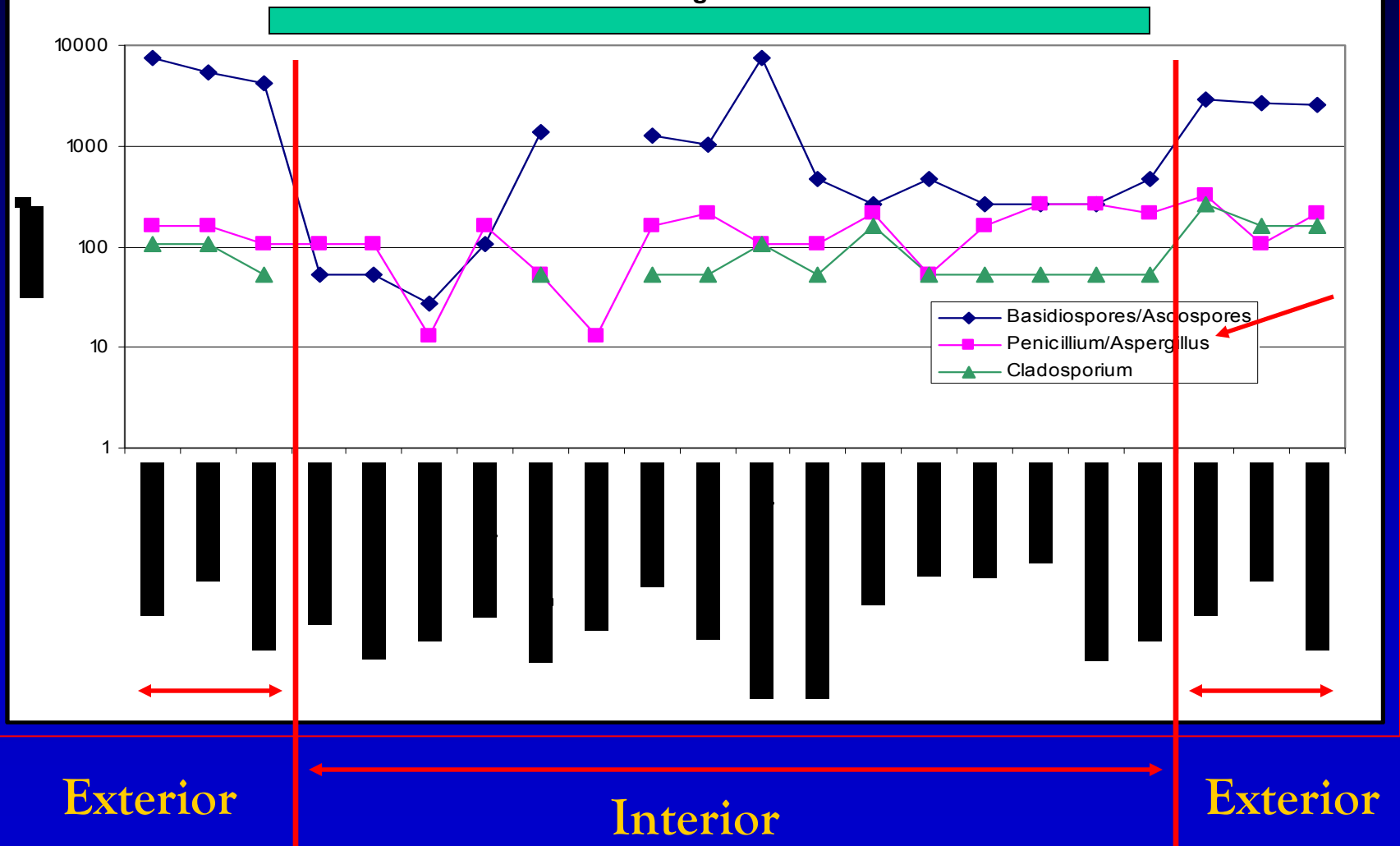
Assessment and Follow Up

Figure 1 - Total Airborne Fungal Concentrations



Assessment and Follow Up

Figure 2 - Basidiospores/Ascospores, Penicillium/Aspergillus and Cladosporium
Total Airborne Fungal Concentrations



Tape lift sample for direct microscopic exam



- Use transparent tape.



- Apply tape, sticky side down, to the inside of a zip-lock baggie.
- Seal it up.

Assessment and Follow Up

- Tape Lift Surface samples collected:
 - 4 in Computer Room
 - Structural and Stored contents
 - 2 in Bulb Room
 - Drywall
- Bulk Samples collected:
 - 2 in Computer Room
 - Wet and Dry Fireproofing from ceiling beams

Environmental Microbiology Laboratory, Inc.
 1150 Bayhill Drive, Suite 100, San Bruno, CA 94066
 (650) 829-5800 Fax (650) 829-5852 www.emlab.com

Client: LaCroix, Pryor, Davis, LLC
 C/O: Mr. Ben Heckman
 Re: 1429-282

Date of Sampling: 12-16-2003
 Date of Receipt: 12-18-2003
 Date of Report: 12-22-2003

DIRECT MICROSCOPIC EXAMINATION REPORT
 (Wet Mount)

Background Debris and/or Description	Miscellaneous Spores Present*	MOLD GROWTH: Molds seen with underlying mycelial and/or sporulating structures†	Other Comments††	General Impression	
Lab ID-Version‡: 344524-1: Tape sample 1429-1216-01T: Gas SVS/bulb room wall (B)	Moderate	Few	4+ <i>Ulocladium</i> species 3+ <i>Penicillium</i> species	None	Mold growth
Lab ID-Version: 344525-1: Tape sample 1429-1216-02T: Gas SVS/bulb room wall (D)	Moderate	Few	4+ <i>Ulocladium</i> species 3+ <i>Penicillium</i> species	None	Mold growth
Lab ID-Version: 344526-1: Tape sample 1429-1216-03T: Computer room, drywall subfloor (C)	Moderate	Few	None	None	Normal trapping
Lab ID-Version: 344527-1: Tape sample 1429-1216-04T: Computer room, cardboard box on floor	Moderate	Few	1+ colorless spores typical of <i>Penicillium</i> / <i>Aspergillus</i>	None	Mold growth
Lab ID-Version: 344528-1: Tape sample 1429-1216-05T: Computer room, computer case	Moderate	Few	1+ <i>Cladosporium</i> species	None	Mold growth
Lab ID-Version: 344529-1: Tape sample 1429-1216-06T: Computer room, cardboard box on shelf	Moderate	Few	None	None	Normal trapping
Lab ID-Version: 344530-1: Bulk sample 1429-1216-07B: Computer room, wet fireproofing	Miscellaneous debris	Very few	None	None	Normal trapping
Lab ID-Version: 344531-1: Bulk sample 1429-1216-08B: Computer room, dry fireproofing	Miscellaneous debris	Very few	None	None	Normal trapping

* Indicative of normal conditions, i.e. seen on surfaces everywhere. Includes basidiospores (mushroom spores), myxomycetes, plant pathogens such as ascospores, rusts and smuts, and a mix of saprophytic genera with no particular spore type predominating. Distribution of spore types seen mirrors that usually seen outdoors.

† Quantities of molds seen growing are listed in the MOLD GROWTH column and are graded 1+ to 4+, with 4+ denoting the highest numbers.

†† Some comments may refer to the following: Most surfaces collect a mix of spores which are normally present in the outdoor environment. At times it is possible to note a skewing of the distribution of spore types, and also to note "marker" genera which may indicate indoor mold growth. Marker genera are those spore types which are present normally in very small numbers, but which multiply indoors when conditions are favorable for growth.

‡ A "Version" greater than 1 indicates amended data.

Thanks for your attention ...

Questions?

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