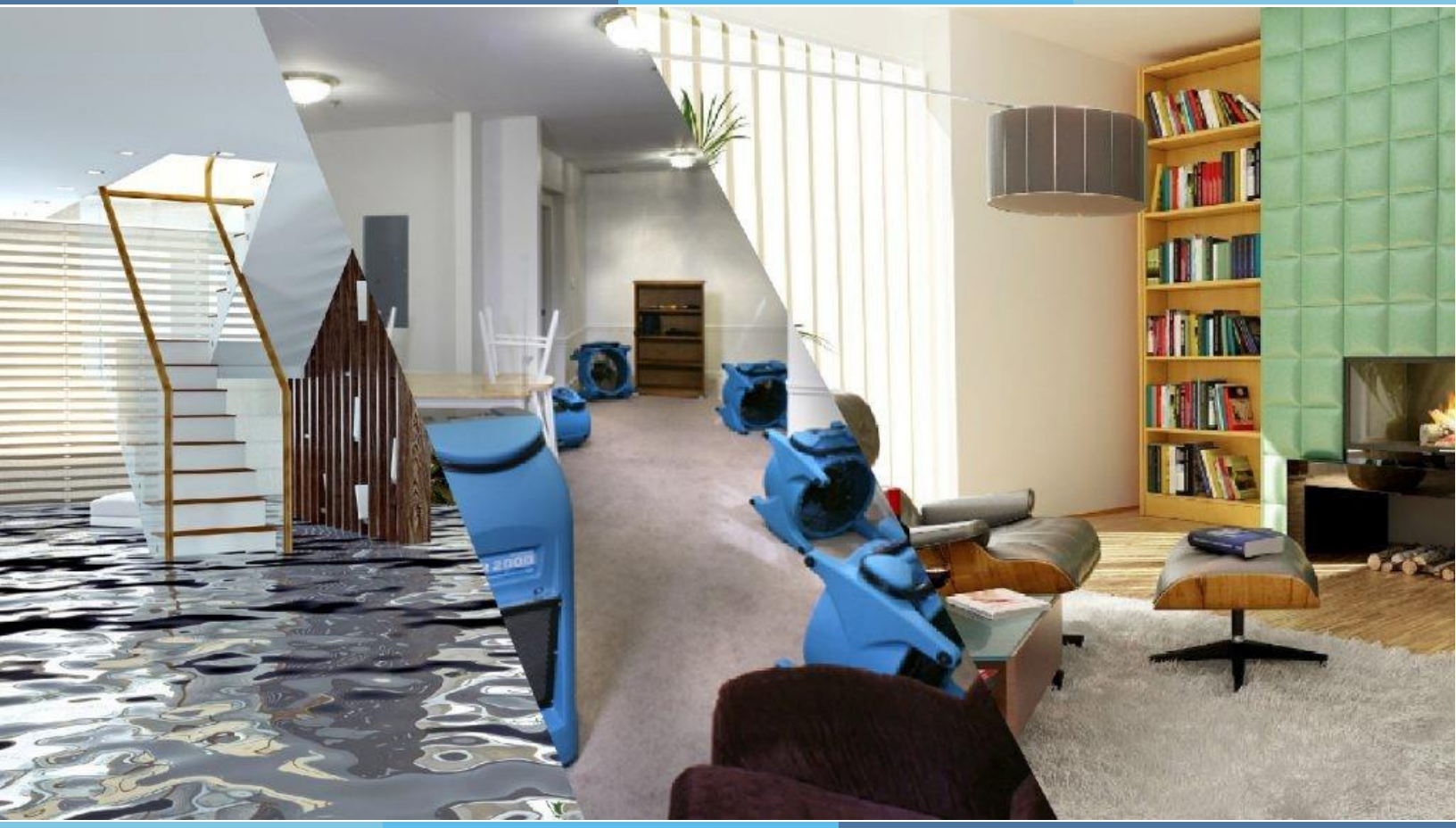
EPA vs IICRC Mold Assessment & Remediation



D-D-R-S
Drying, Disinfection, & Remediation Science
For Contractors, PAs, Attorneys

History / Introduction

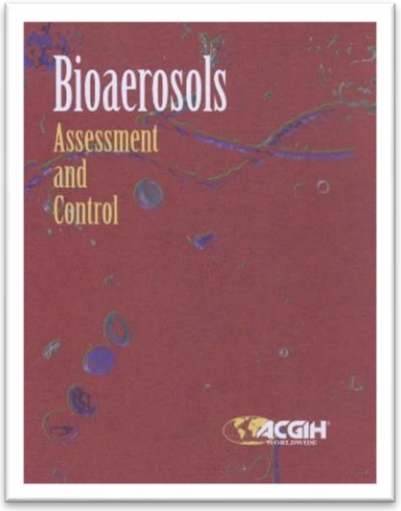
HISTORY/INTRODUCTION

New York City Guidelines:

In 1993, the New York City Department of Health (NYCDOH) first issued recommendations on addressing mold growth indoors.

In 1999 the document was revised and was based on visual assessment criteria (NYCDOH, 1999). According to the document "The size of the area impacted by fungal contamination primarily determines the type of remediation".

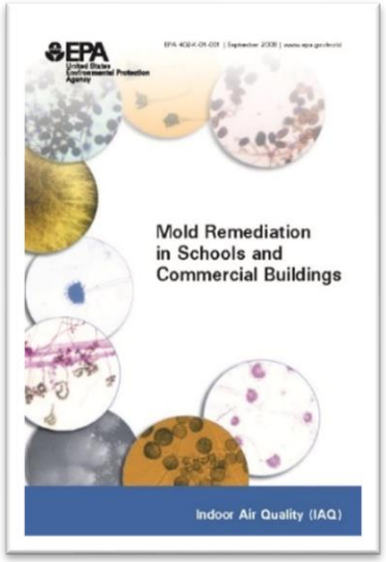
In 2008, NYC released *Guidelines on Assessment and Remediation of Fungi in Indoor Environments*



NYC assessment is based on visual determination of the size of the mold growth.

The American Conference of Governmental Industrial Hygienists (ACGIH) Guidelines:

Bioaerosols: Assessment and Control, published by The American Conference of Governmental Industrial Hygienists (ACGIH) is a comprehensive document addressing all forms of biological contamination in indoor environments (ACGIH, 1999). In section 15.2 of "Bioaerosols" it states: "'Extensive' visible fungal growth has been defined as surface areas greater than 3 m2 (32 ft2)". In the footnote to TABLE 15.1 it reads "'Visible contamination means that fungi are readily observable on surfaces."



EPA Guidelines:

A Guide for Mold Remediation in Schools and Commercial Buildings. EPA document 402-K-01-001, released March 2001. Re-released in 2008. The 2008 guidance had not changed, only the Resources List had been updated. EPA guidelines drew heavily from earlier NYC Guidelines.

EPA assessment is based on visual determination of the size of the mold growth. Cautions when investigating for hidden mold.

ASTM International.

ASTM D7338-14 Standard *Guide for Assessments of Fungal Growth in Buildings*., 2nd Edition 2005.

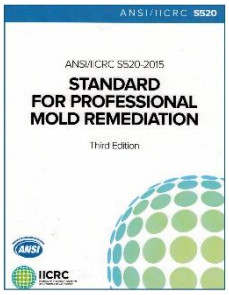
Assessment based on visual methods including moisture readings and intrusive inspections.

History / Introduction

IICRC S520-2015:

In the S520 Foreword it first says S520 is not intended to establish procedures or criteria for assessing mold, and then states they reject the EPA/NYC approach to assessment based on size of mold growth and have replaced with their own assessment criteria based on Conditions 1,2,3.

This is quite the contradiction. The precise wording from the S520 Foreword follows:



- *The ANSI/IICRC S520 is not intended to establish procedures or criteria for assessing mold contamination in an indoor environment.*
- *Thus, ANSI/IICRC S520 represents a philosophical shift away from using "size" of visible mold growth to determine the remediation response. Instead, it establishes mold contamination definitions, (Conditions 1, 2, and 3) and guidance, which, when properly applied, can assist remediators and others in determining remediation response or confirm remediation success.*

IICRC has rejected NYC/EPA and ASTM guidelines based on visual assessment. IICRC assessment is based on testing surface dust for mold contamination Condition 1,2,3.

Holland Paper 2007:

A PRACTICAL AND PHILOSOPHICAL SHIFT AWAY FROM A VISUAL APPROACH TO DETERMINE THE APPROPRIATE RESPONSE TO MOLD REMEDIATION by James Holland, John Banta, and Eugene C. Cole DrPH

James Holland the main author of the "Shift Away" paper was the IICRC Standards Editing Chairman at the time.

This self-published, non peer reviewed article explains the IICRC justification for rejecting visual approach to mold assessment and replacing with Mold Contamination Conditions 1,2,3.

There is no experimental data provided to support the IICRC proposal that Conditions is in any way useful for determining remediation response. The paper explains:

"The inability of the visual approach to accurately identify hidden or concealed mold and to take into consideration contamination from dispersed spores, exposes remediators to potential liability."

The paper therefore concludes that testing surface dust for mold in settled spores is the answer. The paper then references many other publications none of which use the proprietary IICRC mold assessment method called Mold Contamination Conditions 1,2,3.

Not published. There has been no peer review. This practice is contrary to worldwide accepted practices. Lacks scientific validity. Cannot be implemented with meaningful outcomes as defined. Not taught in any IICRC approved mold remediation training courses. Rejected by all IICRC training providers and redefined per current accepted general practice.

Mold Assessment

INTRODUCTION

While there is some commonality between EPA [EPA/CDC/OSHA/ FEMA/HUD — Federal Guidelines] and IICRC mold remediation guidance, they are in many respects quite different, and in some cases polar opposites, as to how mold is both assessed and remediated.

Mold Assessment & Remediation: EPA vs IICRC is not simply a list of what is included in EPA and S520 mold guidance. Rather, we highlight major differences between the two guidelines and offer perspective as to why one or the other may be a better choice for mold professionals with special application to Florida's Mold Laws. As well, we point out several significant inconsistencies found in IICRC S520-2015.

FLORIDA MOLD LAW ASSESSING MOLD

Florida Mold Law 468.8411 Definitions

"Mold assessment" means a process performed by a mold assessor that includes the physical sampling and detailed evaluation of data obtained from a building history and inspection to formulate an initial hypothesis about the:

- origin, identity, location;
- and **extent** of amplification of mold growth of **greater than 10 square feet.**

FLA mold law is based on determining the extent of the mold growth in sq ft.

EPA MOLD ASSESSMENT GUIDELINES Page 6. *Mold Remediation in Schools and Commercial Buildings.*

Remediation Plan

Assess the size of the mold and/or moisture problem and the type of damaged materials before planning the remediation work.

EPA mold assessment is also based on determining the extent of mold growth in sq ft.

IICRC MOLD ASSESSMENT GUIDELINES: IICRC S520-2015 Page 6, 4th paragraph:

Thus, ANSI/IICRC S520 represents a philosophical shift away from using "size" of visible mold growth to determine the remediation response. Instead, it establishes mold contamination definitions, (Conditions 1, 2, and 3) and guidance, which, when properly applied, can assist remediators and others in determining remediation response or confirm remediation success.

IICRC S520-2015 explicitly rejects using size of visible mold growth for Assessment.

IICRC Mold Contamination Conditions

IICRC MOLD CONTAMINATION CONDITIONS DEFINED

Mold Assessment: *a process performed by an indoor environmental professional (IEP) that includes the evaluation of data obtained from a building history and inspection to formulate an initial hypothesis about the origin, description, location, and extent of Condition 2 or 3.*

S520 Mold Contamination Condition 1 *(normal fungal ecology): an indoor environment that may have settled spores, fungal fragments or traces of actual growth whose identity, location, and quantity are reflective of a normal fungal ecology for a similar indoor environment.*

S520 Mold Contamination Condition 2 *(settled spores or fungal fragments): an indoor environment which is primarily contaminated with settled spores or fungal fragments that were dispersed directly or indirectly from a Condition 3 area, and which may have traces of actual growth.*

S520 Mold Contamination Condition 3 *(actual growth): an indoor environment contaminated with the presence of actual mold growth, associated spores, and fungal fragments. Actual growth includes growth that is active or dormant, visible or hidden.*

IICRC S520-2015 page 6, 2nd paragraph:

> The ANSI/IICRC S520 is not intended to establish procedures or criteria for assessing mold contamination in an indoor environment. These issues are most appropriately addressed by professional organizations that represent IEPs.

IICRC defines mold assessment in terms of testing settled dust for Mold Contamination Conditions 1,2,3.

IICRC then states: "*S520 is not intended to establish procedures or criteria for assessing mold*." Quite the contradiction.

IICRC MOLD CONTAMINATION CONDITIONS ANALYSIS

Condition 2 *(settled spores or fungal fragments): an indoor environment which is primarily contaminated with settled spores or fungal fragments that were dispersed directly or indirectly from a Condition 3 [active growth] area, and which may have traces of actual growth.*

- *"… settled spores or fragments that were dispersed directly or indirectly from a Condition 3 [active growth] area …"*

One may ask how testing floor dust for mold spores can tell you either where the spores originated from, or what the remediation response should be.

However, the science shows it cannot do either.

Mold Contamination Conditions Analysis

See Appendix: "*A PRACTICAL AND PHILOSOPHICAL SHIFT AWAY FROM A VISUAL APPROACH TO DETERMINE THE APPROPRIATE RESPONSE TO MOLD REMEDIATION*" by Jim Holland et al. for IICRC rationale behind Conditions replacing Visual Assessment. Note that:

- The Holland paper did not provide or refer to any scientific evidence/ experiments to support testing for Conditions to determine remediation response in of lieu visual assessment.
- There are no laboratories in the U.S. that can analyze floor dust and either conclude or allow the assessor to conclude that "*settled spores or fungal fragments that were dispersed directly or indirectly from a Condition 3 [active growth.]"*
- Mold Assessors never use IICRC defined Conditions to perform initial assessments or to perform Post Remediation Verification testing. But they say they do.

How is this possible? What is the explanation?

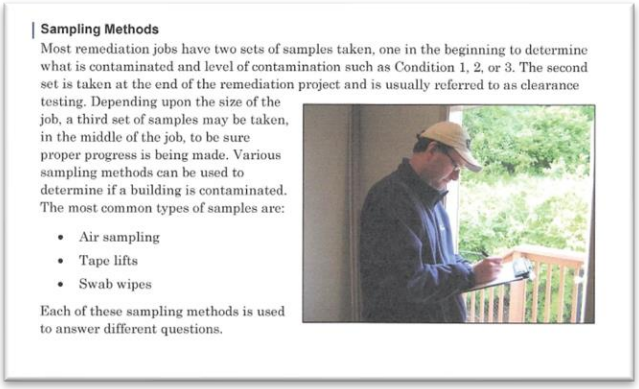
IICRC defined assessment as measuring spores in settled dust is not taught in IICRC-approved mold remediation training courses.

The training providers for the IICRC Mold Remediation courses are IICRC-approved. But the actual training materials are not. Assessment has been re-written in the training courses to reflect how assessors in practice actually assess.

All that IICRC-approved mold remediation training providers are required to do is cover what is needed to pass the IICRC Mold Remediation Exam. No student ever has to buy or read the IICRC S520-2015. And they don't.

IICRC-approved Mold Remediation training schools / programs are free to define Assessment as they see fit. And that is what they do. For example, Restoration Sciences Academy uses the Legends brand training guide *The Complete Guide to Cleaning and Restoration.* Below are two excerpts from that guide. Nothing about Conditions.

"The most common types of samples are: Air sampling; lift tapes; swab wipes.



Sampling Methods

Most remediation jobs have two sets of samples taken, one in the beginning to determine what is contaminated and level of contamination such as Condition 1, 2, or 3. The second set is taken at the end of the remediation project and is usually referred to as clearance testing. Depending upon the size of the job, a third set of samples may be taken, in the middle of the job, to be sure proper progress is being made. Various sampling methods can be used to determine if a building is contaminated. The most common types of samples are:

- Air sampling
- Tape lifts
- Swab wipes

Each of these sampling methods is used to answer different questions.

Contamination Conditions Analysis

Page 44. Legends training for IICRC Mold Remediator: *"Air sampling is the most common method, used on virtually every mold remediation."*

But air sampling is not in any way an IICRC S520 approved assessment procedure where Assessment is defined only as testing settled dust.

Air sampling is the most common method, used on virtually every mold remediation project. The air inside the structure is compared to the outdoor air. If the indoors is contaminated, then the sample will indicate to the CIH "what" the contaminants are, which can then lead to both answers and more questions. The process of air sampling has several steps. Air is drawn into a filter by an air pump. The filter then catches any and all contamination that is in the air. The filter is then sealed and sent to the lab for analysis. Similar samples are taken both indoors and outdoors and the results are compared. There are some limitations to this testing method. For example, during the winter the outdoor air is usually quite free of mold, and thus makes it difficult to find a true baseline reading. Many types of air sampling machines are utilized. Some catch the particulate matter in filters, some in sampling dishes and some on impact plates. The CIH will decide which is best for the particular situation.

The air samples — inside air and outside — provide the CIH with information as to the extent of contamination in the air. This "captured" contamination is sent off to a qualified laboratory and is inspected by a qualified microbiologist who then counts the quantity of mold spores and returns the results to the CIH. The data will show the amount of mold spores in the inside air or the outside air and which is more contaminated. This sampling indicates if we have a contaminated site.

Tape lifts are used to "pick up" whatever is on an actual surface for inspection. A sterile tape is used to pick up the actual contamination. The tape is placed on the surface in question, pushed down lightly to "pick up" whatever is in question and then peeled back. The tape is then packaged and sent off to the lab for analysis. At the laboratory, most often the "nucleo" that has been picked up by the tape lift is placed in a perfect food source (and environment) for mold and is grown. The mold colonies quickly, and then can be identified to the genus level or, in some cases, down to the species level.

Another sampling device is a sterile swab. The swab is wiped against a surface or pushed down into the fibers of a carpet to obtain a sample. The swab is then sealed in a package and sent to the lab for analysis.

Other sampling techniques include dust cassette sampling, contact plate sampling, wall cavity sampling and bulk sampling. Some, or all, of these techniques are used by CIHs based on what they are looking for and how easily they can get to the surfaces and areas they want to sample.

The results of these samples and the comments from the lab are returned to the CIH, who then prepares a report. This report will discuss the results of the investigation and what was learned from gathering a history, visual inspection, moisture readings, and air

44 Microbial Remediation © 2018 Lagrof Brands

WHEN PEOPLE SAY ASSESSMENT PER IICRC, THIS ALMOST ALWAYS MEANS AS LEARNED IN IICRC MOLD TRAINING CLASS. NOT AS PER IICRC S520-2015. IICRC APPROVED TRAINING DOES NOT TEACH TESTING PER IICRC DEFINED CONDITIONS 1,2,3.

SO HOW COULD IICRC HAVE GONE SO WRONG DEFINING MOLD ASSESSMENT?

The main authors of "A PRACTICAL AND PHILOSOPHICAL SHIFT AWAY FROM A VISUAL APPROACH TO DETERMINE THE APPROPRIATE RESPONSE TO MOLD REMEDIATION," which developed the concept of Conditions, were asbestos assessors.

A PRACTICAL AND PHILOSOPHICAL SHIFT AWAY FROM A VISUAL APPROACH TO DETERMINE THE APPROPRIATE RESPONSE TO MOLD REMEDIATION

James Holland[1] REA, John Banta CAIH[1], and Eugene C. Cole[2] DrPH
[1] RestCon Environmental, Sacramento, California
[2] Department of Health Science, Brigham Young University, Provo, Utah

See our Appendix. Main author James Holland.

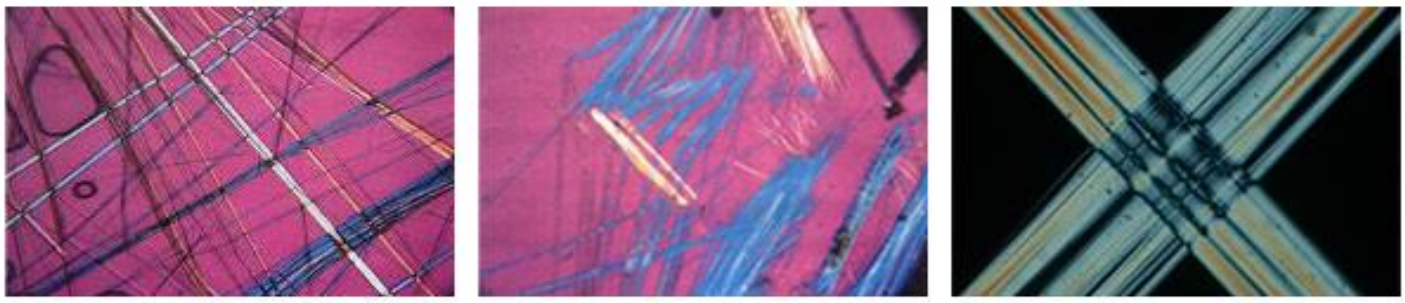
One of the main asbestos assessment procedures is testing for asbestos fibers in settled dust and such testing was adopted / adapted for use as IICRC Conditions.

Refer to: *ASTM D6480 - 19 Standard Test Method for Wipe Sampling of Surfaces, Indirect Preparation, and Analysis for Asbestos Structure Number Surface Loading by Transmission Electron Microscopy*

James Holland the main author of the "Shift Away" paper that rejected visual approach to assessment for Conditions was the IICRC Standards Editing Chairman at the time.

How Could IICRC Go So Wrong?

Asbestos fiber in surface dust is analyzed using transmission electron microscopy that can see the asbestos fibers unimpeded under collected dust. While surface mold in dust is tested using a visual microscope where the dust always interferes with and blocks the analysis.



There is no accepted reliable lab method to distinguish Condition 2 “settled mold spores” that came from “actual mold growth” from mold spores that are background, or just blew in (Condition 1) when a door or window was opened.

Therefore, how can testing for spores in house dust (settled spores), that may date back years, provide an indication as to extent or location of mold in a wall? Or in the ceiling? Or in the AC/ducting?

How can testing for settled spores be used to develop a remediation plan? It cannot.

IICRC PRV Testing: Return to Condition 1

HOW COULD IICRC HAVE GONE SO WRONG DEFINING MOLD PRV TESTING?

Page 16 IICRC S520-2015

> **post-remediation verification:** an inspection and assessment performed by an independent third-party IEP after a remediation project, which can include visual inspection, odor detection, analytical testing, or environmental sampling methodologies to verify that the structure, system, or contents have been returned to Condition 1.

Post Remediation Verification (PRV):

IICRC defines PRV as:

- Verifying that the structure, systems, or contents have been returned to Condition 1 (Normal Fungal Ecology of the Settled Dust).

Condition 1 is testing settled dust. Not by air sampling.

Science has shown that it is mold spores in the air that result in exposure (health concerns) and not mold in dusts. IICRC PRV dust sampling procedures do not measure airborne mold.

How does testing dust on this bedroom chest dresser help you determine where to remediate? It cannot.

It is mold spores in the air in the indoor environment, outside the containment, that determine if there has been cross contamination of the indoor air due to failed remediation.

IICRC assessment procedures then do not in any way consider cross contamination / occupant health to be a concern when performing PRV for Conditions which only tests floor dusts.

And What is Condition 1 (Normal Fungal Ecology)? What could affect the settled spores and result in a false reading that the contractor failed to remove / remediate the actual (recent/current/problem) mold growth?

- How clean the house is of dust on content & floors;
- Old and/or dirty carpets;
- Earlier water events;
  Quality of air filter;
- Mold in the AC, AC closet, plenum or ducting.
- Windows open earlier;

Condition 1: There are no State or Federal standard for a "norma' amount of mold.

Return a property to Normal Fungal Ecology with AC closet looking like this?

IICRC PRV: Requires 3rd Party IEP

HOW COULD IICRC HAVE GONE SO WRONG DEFINING MOLD PRV TESTING?

Page 16 IICRC S520-2015

> **post-remediation verification:** an inspection and assessment performed by an independent third-party IEP after a remediation project, which can include visual inspection, odor detection, analytical testing, or environmental sampling methodologies to verify that the structure, system, or contents have been returned to Condition 1.

Post Remediation Verification (PRV): Is also defined in terms of:

- Only an independent third party IEP can perform testing

Another concern with IICRC S520-2015, since it heavily draws from asbestos procedures, is that with asbestos one must always have a licensed Certified Hygienist perform any testing. The remediator is never legally allowed to test. And this makes sense for asbestos, which is certainly hazardous.

Yet this makes less sense with mold. IICRC S520-2015 prohibits the mold remediator from any form of testing. They are prohibited from performing their own Quality Assurance/Quality Control (QA/QC).

In most states, including Florida, there is no prohibition for a Remediator to perform their own Post Remediation Verification testing assuming the client approves. The client often does approve because they do not want to pay for a 3rd party assessor to test and/or the job is simple.

In addition, regardless of job cost or job size Indeed, many or most clients prefer one contractor to perform both remediation and testing with a single contractor providing a warranty.

Warranty: When there are multiple parties involved, as required by IICRC S520-2015, there is never a clean and clear Warranty. In comparison, the EPA has no such restrictions. Applicable state laws apply. And in Florida, licensed remediators may always perform their own QA/QC because there is always less than 10 sq ft of mold and no applicable mold law restrictions.

IICRC S520-2015 Mold Remediation Guidelines for Containments.

Here we look at the S520 procedures for containments, and again encounter problems and contradictions.

Here the IICRC uses size of mold growth to determine remediation response, despite explicitly stating they do not use size of mold growth for remediation response.

Below are IICRC definitions of their different types of containments (forms of remediation response) found in S520-2015 Chapter 12.

They are all based on the visible size of mold growth.

IICRC Containments Defined

IICRC containments all are defined based on the size of visible mold growth.

12.1.1.1 Containments

During mold remediation projects, containments generally are separated into three basic types: source containment; local ("mini") containment; and full-scale containment. Expanding containments may be necessary when additional mold contamination is discovered.

12.1.1.2 Source Containment

Source containment may be used:

- *to address **relatively small or limited areas of mold growth**, or it can be used in combination with other engineering controls to reduce the amount of spore release and dust generation;*
- *alone when mold growth is limited to small visible controllable areas where hidden mold growth is not anticipated;*
- *within areas of more extensive mold growth in conjunction with other forms of containment.*

When there are small or limited areas of mold growth, and hidden mold growth is suspected, a more extensive containment should be used.

12.1.1.3 Local Containment

*Local or "mini" containments may be used **when moderate levels of fungal growth** are visible or suspected. A structural enclosure can be built to contain a work area and separate it from the unaffected section of the room or structure. In a local containment HEPA-filtered air filtration devices (AFDs), when used as negative air machines (NAMs), are installed to create negative pressure differentials in relation to surrounding areas. In local containments, a HEPA vacuum cleaner can be substituted if it is able to create the necessary pressure differential. However, this works only if the vacuum canister is adequately sized and located outside the containment area.*

12.1.1.4 Full-Scale Containment

*Full-scale containments normally are used when **significant or extensive mold growth** is present or suspected, and where source and local containments cannot effectively control or eliminate cross-contamination. Critical barriers are established to separate unaffected from affected areas.*

IICRC rejects visual size / extent of mold to determine remediation response (type of containment). But then, as we see in IICRC S520-2015 Chapter 12 on Containments, they use size of visible mold to determine remediation response!

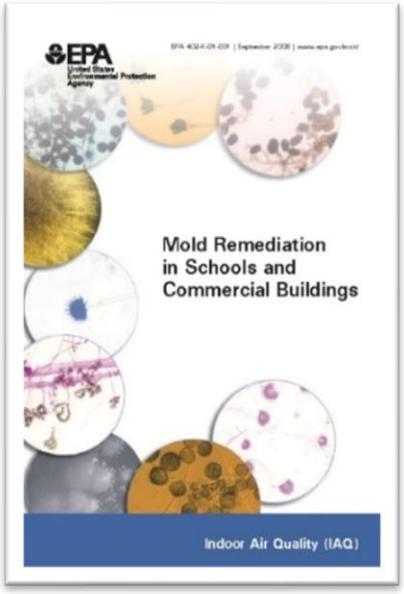
As one might expect, IICRC training courses don't teach these IICRC containment definitions either.

Mold Remediation: EPA vs IICRC

Next, let's take a look at EPA Mold Remediation as defined in "*Mold Remediation in Schools and Commercial Buildings.*"

Comments on EPA Table 2 Mold Remediation Guidelines (shown next page):

- EPA Table 2 provides simple-to-understand and simple-to-implement procedures that are targeted toward school facility managers (janitorial staff) and based on size of visible mold.
- This simple, easy-to-follow advice is a good fit for typical Mold Remediators and Water Damage technicians.
- Base the type of PPE on the size of the visible mold <10 sq ft. 10 — 100 sq ft or > 100 sq ft. The more mold growth, the higher the level of PPE.
- Base the type of containment (None, Limited or Full) on the size of the visible mold <10 sq ft. 10 — 100 sq ft or > 100 sq ft.
  - No testing required. Visual assessment only to determine size/extent of mold;
  - No 3rd party independent IEP/required to test for Conditions.
- With IICRC there is a separate training and certification for:
  - Drying (S500-2015);
  - Mold Remediation (S520-2015);
  - Independent Indoor Environmental Professional / Certified Industrial Hygienist to determine Conditions by testing settled dust.



- Under EPA all the work including assessment, dry-out and remediation, can be performed by a single contractor.

Given the typical background and training of a mold remediator, simpler is usually better. Advantage EPA.

Furthermore, IICRC requires multiple specialists for: (a) dry-out; (b) remediation; and (c) testing for Conditions. This drives up the cost. Advantage EPA.

Mold Remediation: EPA

EPA Table 2. Mold Remediation Guidelines. Summary

Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL – Total Surface Area Affected Less Than 10 square feet (ft^2)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (Linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (Plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (Drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		
MEDIUM – Total Surface Area Affected Between 10 and 100 (ft^2)			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1, 3, 4		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (Linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (Plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3, 4		
Wallboard (Drywall and gypsum board)	3, 4		
Wood surfaces	1, 2, 3		
LARGE – Total Surface Area Affected Greater Than 100 (ft^2) or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1, 3, 4		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (Linoleum, ceramic tile, vinyl)	1, 2, 3, 4		
Non-porous, hard surfaces (Plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3, 4		
Wallboard (Drywall and gypsum board)	3, 4		
Wood surfaces	1, 2, 3, 4		

EPA Mold Remediation Guidance. Based on visual mold growth. Simple and easy to use. Effective results.

Mold Remediation: IICRC S520

Next up: S520 Mold Remediation Guidelines for Demolition and Surface Cleaning. The S520 Mold Removal/Cleaning guidelines are to a large degree excerpted from the OSHA Asbestos Standard for the Construction Industry—again by S520 authors whose background was asbestos.

IICRC S520-2015 12.2.6 Demolition and Surface Cleaning.

Here we look at the S520 procedures for mold remediation, and encounter problems and contradictions.

Remediators should:

- *minimize dust generation and aerosolization;*
- *take care to limit the release of airborne spores and fungal fragments, thereby reducing worker exposure and clean-up efforts;*
- *remove mold growth on wood framing members by HEPA-vacuuming followed by damp wiping, wire brushing, sanding, or other appropriate method, while using HEPA-vacuuming or performing removal within the capture zone of an AFD, along with other appropriate controls;*
    - **Comment:** the first two recommendations would minimize dust, but the third includes wire brushing and sanding, which create dust. Contradiction.

- *seal bagged materials inside a second bag before moving them outside containment area (double bagging), if they pass through Condition 1 areas of the building, to prevent potential cross-contamination;*
    - **Comment:** Double bagging mold is unnecessary. It is not a bio-hazard or asbestos. Asbestos Hazmat guidelines.
- *clean remaining building interior surfaces and containment materials using HEPA vacuuming and damp wiping;*
    - **Comment:** Cleaning containment materials and using HEPA vacuuming and damp wiping before discarding is unnecessary. Asbestos Hazmat guidelines.
- *if new construction materials must be installed for structural integrity prior to completion of the remediation, those materials should also be cleaned along with the rest of the affected area;*
    - **Comment**: It is unnecessary to clean newly purchased construction materials.
- *HEPA-vacuum and damp wipe entry and exit chamber ceilings, walls, flaps and floor of remediation areas;*
    - **Comment:** Cleaning containment materials using HEPA vacuuming and damp wiping before discarding is unnecessary. Asbestos Hazmat guidelines.

- *HEPA-vacuum or damp wipe the outside of bags or wrapped materials, and thereafter place them into a second bag or wrapping, sealing before they are moved from the exit chamber;*
    - **Comment:** Cleaning the outside of the garbage bags before putting them into another bag and discarding is unnecessary. Asbestos Hazmat guidelines.
- *wipe off tools and equipment being removed from the containment area and place in clean sealed bags for detailed cleaning off-site using appropriate precautions;*
    - **Comment**: Cleaning and placing tools in sealed bags is also unnecessary. Asbestos Hazmat guidelines.
- *seal the intake (contaminated) side of Air Filtration Devices (AFDs) before turning the equipment off to prevent back flushing of filtered contaminants;*
    - **Comment:** Covering the air scrubber filter before removing it is unnecessary;. Asbestos Hazmat guidelines.
- *If two sets of disposable coveralls are worn, the first coverall is removed in the first chamber as described in the preceding paragraph. The second set is removed in the second containment chamber and hung up for reuse as the outer coverall when re-entering the workspace. If the inner disposable coverall has been damaged, it shall not be reused, but rather disposed in the second chamber;*
    - **Comment:** Unnecessary. Asbestos Hazmat guidelines.

8.11 Safe Work Practices in Contaminated Buildings

- *do not move used protective clothing from one area to another unless properly contained;*
    - **Comment:** Unnecessary. Again, these are Asbestos Hazmat guidelines.
- *wear latex or nitrile chemical-resistant or vinyl gloves while inside containment areas, designated work areas, or while handling bagged contaminated materials; wear a second pair of gloves (rubber, textile, or leather work gloves) to protect against personal injury;*
    - **Comment:** Wearing two pairs of gloves while using power tools and drywall knives increases potential for injury. Unnecessary. These are Asbestos Hazmat guidelines.
- *use protective disposable coveralls with attached or separate shoe covers;*
    - **Comment:** These are Asbestos Hazmat guidelines**.**

8.3.2.1 Respirator Use and Written Respiratory Protection Plan

- *Employees shall wear respirators whenever engineering and work practice controls are not adequate to prevent atmospheric contamination at the job site...*

  Respiratory protection regulations are found at 29 CFR 1910.134. Respiratory protection program outlines written program requirements, and shall include, but not be limited to:

  - *selection and use of NIOSH-approved respirators;*
  - *medical evaluation;*
  - *respirator fit testing;*
  - *user instruction and training in the use and limitations of the respirator prior to*
  - *wearing it;*
  - *designated program administrator;*
  - *cleaning and maintenance program.*

- **Comment:** These are asbestos hazmat guidelines. Hazardous respiratory conditions trigger OSHA respiratory protection program: 29 CFR 1910.134. **$10,000 fine for non-compliance.** EPA requires N-95, gloves, goggles—that's it. Because mold is not a biohazard, with EPA there is no OSHA respiratory plan compliance required. Advantage EPA.

8.3.2.11. Respirators

- *HEPA filter cartridges should be used to protect against fungal spores and fragments, bacterial spores, dust, and particles;*

  - **Comment**: These are hazmat guidelines. Hazardous respiratory conditions trigger OSHA respiratory protection program: 29 CFR 1910.134. **$10,000 fine for non-compliance.**

Perhaps the biggest problem for mold remediators is that IICRC S520-2015 treats mold as a biohazard. EPA does not. Advantage EPA.

Wearing hazmat gear triggers OSHA 29 CFR 1910.134 respiratory program compliance. Mold remediators wearing hazmat gear that do not follow OSHA Respiratory Program are working illegally. $10K fine per occurrence.

WHEN REMEDIATORS PERFORM ILLEGAL WORK, THEIR INVOICES ARE NOT ENFORCEABLE.

9.6.2 Risk Management

- *Remediators shall carry adequate amounts of General Liability, Automobile Liability, and Workers Compensation insurance coverage when required by statute.*
    - **Comment:** Because IICRC treats mold a biohazard, remediators must be covered by Workers Compensation for hazardous conditions**.**

Perhaps the biggest problem for mold remediators is that IICRC S520-2015 treats mold as a biohazard. EPA does not.

Wearing hazmat gear triggers the requirement that Workers Comp be upgraded to Workers Comp for hazardous conditions. Mold remediators wearing hazmat gear without Workers Comp for hazardous conditions are working illegally.

If remediators are performing illegal work their invoices are not enforceable.

Few to no Mold Remediators who follow S520 procedures, which considers mold a biohazard, comply with either OSHA Respiratory Program or have appropriate Workers Comp coverage for hazmat conditions.

From a practical point of view, following IICRC S520-2015 mold remediation guidelines results in Illegal Work.

Advantage EPA.

MOLD REMEDIATION: EPA vs IICRC

Summary: How do EPA/OSHA/CDC [EPA] Mold Remediation Procedures Differ from IICRC S520-2015?

As we have seen, EPA and IICRC mold assessment guidance is completely different.

Fundamentally, at issue is that IICRC mold assessment is taken directly from asbestos assessment guidance, even though it does not make sense for mold work.

Furthermore, while the EPA (and Florida mold law) uses the size of mold growth in sq ft to determine remediation response—the type and size of the containment to use—the IICRC S520-2015 rejects the size of mold growth for determining remediation response and instead uses Conditions 1 ,2, 3 (spores in settled dust). IICRC Mold Contamination Conditions are proprietary.

IICRC Mold Contamination Conditions are not compatible with:

- EPA/CDC/FEMA/HUD guidelines;
- AIHA (American Industrial Hygiene Association) *A Field Guide for the Determination of Biological Contaminants in Environmental Samples;* or the
- ASTM D7338-14 Standard *Guide for Assessments of Fungal Growth in Buildings*., 2nd Edition 2005; nor
- Florida Mold Law.

While IICRC states that they reject size for determining remediation response (type of containment), they then define remediation response in terms of size of mold:

- relatively small or limited areas of mold growth
- moderate levels of fungal growth
- significant or extensive mold growth

How does this make sense? How does a mold technician sort this out? How does a mold technician comply? How does a mold technician justify what has been done in terms of IICRC procedures when deposed?

As we have seen, EPA and IICRC mold remediation guidance are almost polar opposites.

EPA procedures are based on mold being all around us. Mold is not a biohazard — take reasonable precautions. IICRC considers mold a biohazard and has to a large degree copied Asbestos Remediation Guidelines and changed the name of the procedures to Mold Remediation Guidelines.

Realistically, few contractors follow IICRC S520 assessment or remediation procedures. The training courses approved by IICRC to teach S520 do not teach S520 nor are students ever required to purchase or read S520.

But contractors who have never read S520 almost always say they follow S520 — which is easy to claim because students (why wouldn't they?) assume that what was learned in IICRC-approved Mold Remediation training teaches S520.

Our advice: Best to follow EPA's simple-to-understand guidance.

When it comes to mold (and most other things) seeing is believing.

APPENDIX

A PRACTICAL AND PHILOSOPHICAL SHIFT AWAY FROM A VISUAL APPROACH TO DETERMINE THE APPROPRIATE RESPONSE TO MOLD REMEDIATION

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Introduction

In 1993 The New York City Department of Health (NYCDOH) ". . . *convened an expert panel on Stachybotrys atra in Indoor Environments. The purpose of the panel was to develop policies for medical and environmental evaluation and intervention to address Stachybotrys atra (now known as Stachybotrys chartarum (SC) contamination.*" In 1999 the document was revised to include all mold contamination but retained its visual assessment criterion (NYCDOH, 1999). The original document was designed primarily to provide guidance for the New York City janitorial staff that maintained city buildings. In the remediation section of the current version of the policy, it was decided that there were to be five levels of response (<10 ft^2, 10-30 ft^2, 30-100 ft^2, >100 ft^2, HVAC). According to this document, "*The size of the area impacted by fungal contamination primarily determines the type of remediation*" and that "*. . . sampling for fungi should not be part of a routine assessment. This is because decisions about appropriate remediation strategies usually can be made on the basis of a visual inspection."* Therefore, each level of response was based on the extent of fungal contamination using a visual inspection arbitrarily reported in square foot dimensions, without apparent scientific basis.

The American Conference of Governmental Industrial Hygienists (ACGIH) likewise published *Bioaerosols: Assessment and Control,* a comprehensive document addressing all forms of biological contamination in indoor environments (ACGIH, 1999). Conventional wisdom at that time apparently was based upon the same information that was used by the NYCDOH in establishing their remediation response to mold problems in buildings. In section 15.2 of "*Bioaerosols*" it states: "'*Extensive' visible fungal growth has been defined as surface areas greater than 3 m^2 (32 ft^2)*". In the footnote to TABLE 15.1 it reads "'*Visible contamination' means that fungi are readily observable on surfaces . . . .*"

In 2001, the U.S. Environmental Protection Agency published a document entitled, "*Mold Remediation in Schools and Commercial Buildings*" (EPA, 2001). This publication continued the practice of determining remediation response

based upon the extent of mold contamination as it was visually detected and reported in square feet. Thus, EPA defined response levels as small, medium and large based upon <10 ft^2, 10-100 ft^2, and >100 ft^2, respectively.

These latter publications started addressing the evaluation of mold contamination problems in buildings. The use of visually detectable amounts of mold growth as the criteria for describing the extent of contamination was easy to understand and implement. As a result, this strictly visual approach unfortunately became a popular method for determining a remediation response.

In 2005, The National Institute of Environmental Health Sciences (NIEHS) introduced *Guidelines for the Protection and Training of Workers Engaged in Maintenance and Remediation Work Associated with Mold* (NIEHS 2005). This document reviewed the size recommendations made by NYCDOH, EPA, Health Canada and ACGIH. NIEHS chose to follow the same path of using a visual assessment with the caveat that this assessment needed to be considered along with work practices and duration of exposure. There was no reference to pre-remediation sampling as a component in determining the scope of work or identifying areas of concealed mold growth or contamination due to dispersed settled spores. However, there was a reference to ensuring that areas of settled spores and fungal fragments be thoroughly cleaned.

Mold remediation frequently has been compared to asbestos abatement. There has been perhaps an unintentional attempt to apply asbestos abatement regulations and procedures to the remediation of mold. This might be a reason why the issue of size, based upon a visual inspection, has gained momentum. There are some regulations that deal with asbestos abatement that are based on the size of the area that is to be removed. A major problem with using asbestos as a model for mold remediation is that asbestos is an applied material that generally stays where it was installed unless disturbed. This results in a consistent ability to predict the size of the area requiring asbestos abatement. Since mold can grow in virtually any area to which water migrates and remains damp over time, mold remediation by its nature usually ends up less predictable with respect to the size of the area of growth and the location in which it can grow.

Limitations and Consequences of a Visual Approach

The publications mentioned above, rely on locating visible mold growth without consideration given to the dispersion and settling of spores that could result in contamination to adjacent areas. However, they do provide some warnings about hidden or concealed mold growth. Generally, the inclusion of pre-remediation sampling was not recommended as part of the assessment.

There are at least two major limitations in only using a visual approach to determine the “size” or “extent” of contamination and for determining the

appropriate remediation response. The first is that it does not take into consideration hidden, concealed (not readily visible) mold growth and the second is that it does not take into consideration contamination resulting from settled spores that were dispersed from areas of actual growth. Failing to address these two limitations prior to beginning remediation can result in a variety of undesirable consequences. They include but are not limited to:

1. An inaccurate scope of work;
2. Containment being erected in the wrong locations;
    a. containment might not include all areas of contamination, resulting in failed post-remediation sampling, extra work and prolonged project time;
    b. containment might include a greater area than is actually contaminated resulting in additional and unnecessary work and expense;
3. Customer dissatisfaction, and
4. Potential litigation.

Without sampling, areas that are contaminated with dispersed spores either will be disregarded or inaccurately estimated. Additionally, containment will most likely be located in inappropriate locations and areas of hidden or concealed mold growth may or may not be discovered as the remediation proceeds. The problem with discovering concealed mold within the workspace is that, first, it must be in the work area or it will be missed; second, in following some of the guidelines mentioned above, containment may not be specified or used. When areas of concealed or hidden growth are then accessed, mold spores and fragments can be dispersed throughout the uncontained area.

The most widely accepted interpretation of the NYCDOH and the EPA publications is that they do not recommend sampling as part of determining the presence and extent of contamination, nor to determine the scope of remediation. Therefore, determining the remediation response level is based upon a visual inspection only; however, this is not specifically what the documents state.

The New York City Guidelines (1999) state:

"2.1 Visual Inspection

A visual inspection is the most important initial step in identifying a possible contamination problem. The extent of any water damage and mold growth should be visually assessed. This assessment is important in determining remedial strategies.

2.2 Bulk/Surface Sampling

a. *Bulk or surface sampling is not required to undertake a remediation. Remediation (as described in Section 3, Remediation) of visually identified fungal contamination should proceed without further evaluation.*

2.3 Air Monitoring

a. *Air sampling for fungi should not be part of a routine assessment. This is because decisions about appropriate remediation strategies can usually be made on the basis of a visual inspection.*

c. *Air monitoring may be necessary if there is evidence from a visual inspection or bulk sampling that the ventilation systems may be contaminated. The purpose of such air monitoring is to assess the extent of contamination throughout a building. It is preferable to conduct sampling while ventilation systems are operating.*

d. *Air monitoring may be necessary if the presence of mold is suspected (e.g., musty odors) but cannot be identified by a visual inspection or bulk sampling (e.g., mold growth behind walls). The purpose of such air monitoring is to determine the location and/or extent of contamination."*

It has become widely recognized that, in problem buildings, it is more likely that there will be hidden or concealed mold. In support of the position, the American Industrial Hygiene Association (AIHA) has stated, "*Studies of microbial problems in large buildings have shown that perhaps 50% of microbial problems are not visible*." (AIHA, 1996) Similarly, a recent study indicated that out of 100 problem (mold contaminated) homes that were investigated for mold-related problems, only 16% of their inspections had visible mold and 84% had no visible mold (Lorenz, 2002). Therefore, it is a reasonable argument that based upon 2.3.d of the NYCDOH document, that sampling is needed to "*determine the location and/or extent of contamination."*

As mentioned, one limitation of a visual inspection is that it cannot determine the potential for contamination of the surrounding indoor environment caused by dispersed *"mold spores, whose identity, location and quantity are not reflective of a normal fungal ecology for similar indoor environments, and which may produce adverse health effects, cause damage to materials and/or adversely affect the operation or function of building systems"*. (IICRC S520) Therefore, the statement made at 2.3.d. in the NYCDOH guidelines that: "*The purpose of such air monitoring is to determine the location and/or extent of contamination,"* would support the need for sampling. Thus, to determine an appropriate scope of mold remediation, sampling is necessary to delineate Conditions 1, 2 or 3.

Likewise the **EPA's *Mold Remediation in Schools and Commercial Buildings*** states**:**

"Sampling

Is sampling for mold needed? In most cases, if visible mold growth is present, sampling is unnecessary. In specific instances, such as cases where litigation is involved, the source(s) of the mold contamination is unclear, or health concerns are a problem, you may consider sampling as part of your site evaluation. Surface sampling may also be useful in order to determine if an area has been adequately cleaned or remediated."

The same arguments can be applied to the EPA's position on sampling as was applied to the NYCDOH document. Interestingly the EPA makes the following statement: *"If microbial problems are visible, a program of sampling is still often justified because in most circumstances it is useful to the building owner and to the affected occupants to know the precise nature and extent of the contamination."*

The *Field Guide for the Determination of Biological Contaminants in Environmental Samples* (AIHA 2005) states that sampling for biological agents can assist complaint investigations by helping, *"to resolve doubts, facilitate the success of the investigation, or document the seriousness of reported hazardous conditions or suspected exposures."*

Liability Exposure When Using a Visual Approach

The inability of the visual approach to accurately identify hidden or concealed mold and to take into consideration contamination from dispersed spores, exposes remediators to potential liability. Incomplete or failed remediation results in higher costs and projects delays. Another potential problem is inadvertent exposure of occupants that can then lead to litigation. There is also the potential consequence of unnecessary remediation. When the scope has not been accurately determined, the containment and subsequent remediation might be applied to areas that are not in need of remediation. The cost for this unnecessary work can result in additional monetary losses to property owners, insurance companies or landlords.

Therefore, when only using a visual approach for establishing mold remediation procedures, one must assume that a job scope and placement of containment will, more often than not, be wrong. Professional remediators generally cannot afford, and usually will not be absolved from, the liability and consequences of their decisions. Indoor environmental professionals (IEP) frequently disclaim responsibility for hidden, unanticipated, and changing conditions. Professional remediators should recognize and anticipate that a scope of remediation may change. Even when an IEP has been retained to provide oversight on a project, a remediator remains responsible for recognizing, reporting and responding to these unanticipated situations by exercising professional judgment.

The NYCDOH document includes an appropriate warning under the "Remediation" heading that reads: "*The goal of remediation is to remove or clean*

contaminated materials in a way that prevents the emission of fungi and dust contaminated with fungi from leaving a work area and entering an occupied or non-abatement area, while protecting the health of workers performing the abatement."

The EPA has a similar warning under the subheading "Hidden Mold". **"***You may suspect hidden mold if a building smells moldy, but you cannot see the source, or if you know there has been water damage and building occupants are reporting health problems. Investigating hidden mold problems may be difficult and will require caution when the investigation involves disturbing potential sites of mold growth—make sure to use personal protective equipment (PPE). For example, removal of wallpaper can lead to a massive release of spores from mold growing on the underside of the paper. If you believe that you may have a hidden mold problem, you may want to consider hiring an experienced professional. If you discover hidden mold, you should revise your remediation plan to account for the total area affected by mold growth.*"

The problem with proceeding with a remediation project that does have hidden mold is that once you "discover" it, as in the example referenced in the EPA warning, mold spores, in all likelihood, already will have been dispersed into otherwise uncontaminated areas. That being the case, who is going to pay for the additional and perhaps unnecessary cleanup? Remediation firms may find that, if they submit such cleanup costs to their insurance liability carrier, the insurance carrier may deny the claim as a result of the "pollution exclusion" in their Commercial General Liability (CGL) coverage.

The Philosophical Shift

In 2000, the Indoor Environmental Institute (IEI) approached the Institute of Inspection, Cleaning and Restoration Certification (IICRC) with a proposal to develop a mold remediation standard. Later the Indoor Air Quality Association (IAQA) also participated. These three organizations, under the auspices of IICRC, cooperated to produce the first edition of the IICRC S520 *Standard and Reference Guide for Professional Mold Remediation* (IICRC, 2003). The stated purpose of this standard is to: *". . . define criteria and methodology to be used by the remediator for inspecting and investigating abnormal moisture and mold contamination, and for establishing remediation and safety plans and procedures*."

The Foreword of the IICRC S520 states: "*Remediators and other parties to the remediation process often request specific guidance regarding quantities of mold or mold spores that trigger remediation activities or confirm remediation success. Quantifying visible levels of mold growth alone is not feasible as an action level decision criterion, because of the wide range of occupant susceptibility and the inability to precisely measure exposure, along with insufficient science to support conclusions in this area at the time of publication.*

Thus, [IICRC] S520 represents a philosophical shift away from setting numerical mold contamination action levels. Instead, it establishes mold contamination definitions, conditions (1, 2, 3) and general guidance, which, when properly applied, can assist remediators and others in determining criteria that trigger remediation activities or confirm remediation success."

The IICRC S520 defines Conditions as follows:

Condition: for the purpose of this Standard, Conditions 1, 2, and 3 are defined for indoor environments relative to mold.

Condition 1 (normal fungal ecology)**:** an indoor environment that may have settled spores, fungal fragments or traces of actual growth whose identity, location and quantity are reflective of a normal fungal ecology for a similar indoor environment.

Condition 2 (settled spores)**:** an indoor environment which is primarily contaminated with settled spores that were dispersed directly or indirectly from a Condition 3 area, and which may have traces of actual growth.

Condition 3 (actual growth): an indoor environment contaminated with the presence of actual mold growth and associated spores. Actual growth includes growth that is active or dormant, visible or hidden.

Since there is a potential mold problem on most water damage restoration projects when there is a delayed response or a pre-existing condition, investigations should be conducted. This investigation includes gathering information, conducting an inspection, and then making a preliminary determination.

This is not a new approach. It is a more appropriate scientific approach. As referenced by ACGIH (1999), an investigation should include the following four steps.

1. Gather information;
2. Formulate a hypotheses;
3. Test the hypotheses, and
4. Make recommendations.

The old adage, "An ounce of prevention is worth a pound of cure" applies to performing inspections. The IICRC recommends this thinking when evaluating water losses and mold remediation projects. The first edition of the S520 highly recommends that remediators obtain a building history, perform a building inspection (which includes any comments from the occupants about their reactions to the indoor environment) and make a preliminary determination as to whether or not there is a mold problem that is either visible or concealed. The compilation of a building's history, along with the inspection results, corresponds

to the "*gather information"* step. The preliminary determination is comparable to the "*Formulate a hypothesis"* step. If the preliminary determination is that there is suspected or actual mold growth, then an IEP is used to "*Test the Hypothesis"* and "*Make Recommendations"* for remediation. Those recommendations would include location of mold growth and presence or absence of dispersed spores (Condition 2). Performing a more thorough inspection and utilizing sampling as part of the process is an ounce of prevention.

Not accepting a numerical value based upon a visual inspection to determine the extent of contamination presents an issue similar to that of interpreting occupant exposures to indoor mold. To date, neither industry nor governments have been able to promulgate science-based threshold levels for exposure to molds, and therefore have resisted pressure to arbitrarily establish numerical values as acceptable exposure limits. This situation is no different for the professional remediator. Without establishing permissible exposure limits and a model to calculate the dispersal of mold spores and associated particles, the practice of using an arbitrary size of an affected area, to determine the appropriate remediation response based solely upon a visual inspection, is not consistently accurate or appropriate.

The Advantage

The IICRC S520 approach to determining an appropriate mold remediation response has a number of advantages over a visual inspection:

1. It helps to more accurately determine the extent of mold contamination that is either visible or concealed as a result of dispersed, settled spores;
2. It allows remediators to determine the actual scope of work and where to place appropriate containment;
3. It minimizes the need to perform additional cleaning because of an incomplete scope of work;
4. It minimizes the potential for inadvertent exposure to occupants due to incomplete remediation;
5. It minimizes the potential for contaminating areas that were otherwise not contaminated when opening interstitial areas of a building;
6. It minimizes the potential for excessive remediation due to not determining an accurate scope of work, and
7. It minimizes the potential for litigation and customer dissatisfaction.

Conclusion

As previously mentioned, initial efforts to establish a method for determining the extent of mold contamination and a subsequent remediation response was a good first step. However, those efforts were too general in scope to adequately

help professional remediators establish an accurate scope of work. In most cases, those efforts focused primarily on building maintenance staff. Professional remediators do not have the luxury of being in a building night after night performing on-going maintenance and cleanup. It was decided that a different approach, that was more comprehensive and better served professional remediators, was needed. The Institute of Inspection Cleaning and Restoration Certification (IICRC) along with Indoor Environmental Institute (IEI) and the Indoor Air Quality Association (IAQA) collaborated to produce the IICRC S520 *Standard and Reference Guide for Professional Mold Remediation* (IICRC, 2003). The result has been an industry-consensus approach to a comprehensive inspection and preliminary determination process that has helped resolved the many limitations, complexities, conflicts, and complications that have been associated with an inspection based solely upon a visual assessment.

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