



GUIDANCE DOCUMENT

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GUIDELINES FOR MOLD ABATEMENT CONTRACTORS

1. Introduction

On June 7, 2006, the Governor of the State of Connecticut signed into law Public Act No. 06-195, *An Act Concerning Revisions To Department of Public Health Statutes*. Section 40 of the Act directs the Connecticut Department of Public Health (CT DPH) to publish guidelines establishing mold abatement protocols that include acceptable methods for performing mold remediation or abatement work. The Act notes that these guidelines are not to be deemed as regulations. The intent of the *Connecticut Guidelines for Mold Abatement Contractors* is to fulfill the legislative mandate set forth in Public Act 06-195 sec. 40.

2. Intended Audience

The *Connecticut Guidelines for Mold Abatement Contractors* is intended to provide guidance to contractors performing mold abatement. It refers readers to information in the documents mentioned below, and to other reference materials. This guidance document is available for general distribution on the CT DPH website <http://www.ct.gov/dph>, and may be useful to other professionals and the general public who are interested in indoor environmental quality (IEQ) and mold abatement.

3. Basic Tenets Concerning Mold In Indoor Environments

The basic tenets listed below should be followed whenever there is a concern about mold:

- Find the source of the water
- Stop the water/ fix the leak
- Remove moldy materials
- Discard porous materials that have remained wet for over 48 hours
- Perform mold abatement as appropriate, according to an abatement plan designed for the particular site

The *Connecticut Guidelines for Mold Abatement Contractors* will refer to other guidelines for much of the detailed recommendations for mold remediation. These other guidelines have been written for building engineers, property managers, school officials, abatement contractors, and the public. They include guidelines written by the New York City Department of Health and Mental Hygiene¹, U.S. Environmental Protection Agency (EPA)², the Canada Mortgage and Housing Corporation³, Health Canada⁴, and the Institute of Inspection Cleaning and Restoration Certification (IICRC)⁵.

4. Professional Involvement

A. Abatement Contractors

There are a number of types of professional contractors that perform various kinds of environmental abatement. These include environmental contractors such as those who perform lead, radon, and/or asbestos abatement, and restoration and cleaning contractors involved in water restoration, smoke and fire restoration, and carpet cleaning specialists. Before entering into the mold abatement business, any contractor should acquire professional training in this area, and become familiar with technical and reference materials referenced in this document.

B. Training

Contractors should be trained to use state-of-the-art techniques when performing mold abatement to keep building occupants and their own workers safe. The State of Connecticut does not offer training or licensure for mold abatement contractors. There are a number of professional organizations and trade groups that have created credentialing and standards-setting programs in order to “self-police” the industry, in the absence of federal and state regulations. Below is a list of some of the national organizations offering training and credentialing in mold abatement. This list should not be considered comprehensive. It should be noted that the quality of the training one receives might vary greatly depending upon the organization sponsoring the training, the curricula, and the actual trainer.

Organization	Acronym	Web address
Institute for Inspection, Cleaning and Restoration Certification	IICRC	http://www.iicrc.org
Association of Specialists in Cleaning and Restoration	ASCR	http://www.ascr.org
American Indoor Air Quality Council	AmIAQ	http://www.iaqcouncil.org
Indoor Air Quality Association	IAQA	http://www.iaqa.org
Interactive Occupational Training	IOT	http://www.iot-edu.com

One organization for contractors, the Institute for Inspection, Cleaning and Restoration Certification (IICRC), has published a voluntary standard for professional mold remediators called *IICRC Standard and Reference Guide for Professional Mold Remediation, S520*, first published in December 2003. This standard is currently being revised. The expected release time frame for the second edition is 2008. The *CT Guidelines for Mold Abatement Contractors* refers readers to the most current version available of *IICRC S520* for a detailed

discussion about the technical aspects of mold abatement that space does not allow for here. The CT DPH recommends that as a minimum competency, all mold abatement contractors doing business in Connecticut follow the principles and practices stated in the most current version of *IICRC S520*. Further, we recommend that every mold abatement job site have a full-time supervisor at the jobsite who is formally trained to understand the principles and practices described in *IICRC S520*. Additionally, we recommend that all workers other than the job-site supervisor be adequately trained so that they understand the proper use of personal protective equipment (PPE), know how and when to use such equipment, and can work in a safe manner without causing harm to themselves, fellow workers and building occupants, or the building.

C. Third Party Oversight – The Industrial Hygienist/Indoor Environmental Professional

Third party oversight should be used whenever the mold abatement contractor has questions about how to abate a certain area, whether certain methods should be employed, or if unusual circumstances exist such as health considerations of building occupants, or questions about how much of an area should be abated (i.e., half of the wall vs. the entire wall). Some specific examples of when third party oversight is recommended are:

- During mold abatement project(s) in a hospital, nursing home, rehabilitation facility or medical clinic
- In any setting where there are immunocompromised persons
- Where there has been raw sewage contamination and a determination must be made about what can be salvaged
- Where an independent assessment is called for
- Where it is determined that it would be beneficial to collect samples based upon a hypothesis generated from a site assessment. *NOTE- the Industrial Hygienist/Indoor Environmental Professional (IH/IEP) should consult with their lab* prior to going to the site for instructions on how the lab wants the samples collected and transported.*

*Laboratories should be accredited by the American Industrial Hygiene Association and be a current, successful participant in the Environmental Microbiology Laboratory Accreditation Program (EMLAP). EMLAP is specifically designed for labs identifying microorganisms commonly detected in air, fluids, and bulk samples during indoor air quality studies in a variety of settings. Participation assists the laboratory in maintaining high quality standards.⁶

Note that if microbiological samples are to be collected and interpreted for the client, this should be performed by the IH/IEP and not the mold abatement contractor.

CT DPH recommends that all individuals acting as consultants on mold abatement projects, whether they are industrial hygienists and/or independent environmental professionals, obtain training regarding indoor air quality and sampling for and interpretation of bacteria and mold in indoor environments.

The American Industrial Hygiene Association (AIHA) [<http://www.aiha.org/>], American Conference of Governmental Industrial Hygienists (ACGIH) [<http://www.acgih.org/>] and American Indoor Air Quality Council [<http://www.iaqcouncil.org/>] are some of the national organizations providing this type of training.

5. Environmental Assessment

The first step in most mold investigations should be to take a building history. Answers to important questions like age of the building and of the roof, construction history, history of water damage, leaks/floods, and maintenance history helps the IH/IEP and mold abatement contractor gain a larger picture about the building, and may impact sampling and/or remediation strategies.

During the initial walkthrough, emphasis should be placed upon looking for evidence of water damage, because this is where mold is likely to be found. Taking note of musty, moldy odors is often a good way to begin an investigation and head towards the direction of the source of the odor (mold). As the basic tenets note (section 3), the source of the water must be found and stopped *immediately*, moldy materials must be removed and replaced (if porous), the area must be dried, and abatement must take place according to these guidelines.

Decisions about appropriate remediation strategies are not always reliably made based upon visual inspection alone. Mold may be growing in places that are not readily observable, such as on the reverse side of wallboard panels, inside of wall cavities, and inside of HVAC systems. This is what is often referred to as “hidden mold”. Hidden mold should be remediated along with mold that is readily visible. Other tools in addition to our senses of sight and smell may be employed to alert the mold abatement contractor to the presence of hidden mold. Some of these are discussed briefly below.

A. Visual Inspection

Visual inspection of the property may be conducted by the mold abatement contractor, third party consultant (IH/IEP), or both. According to the NYC *Guidelines on Assessment and Remediation of Fungi in Indoor Environments*, “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. Ventilation systems should also be visually checked, particularly for damp filters but also for damp conditions elsewhere in the system and overall cleanliness. Ceiling tiles, gypsum wallboard (sheetrock), wallpaper, cardboard, paper, and other cellulosic surfaces should be given careful attention during a visual inspection. The use of equipment such as a boroscope, to view spaces in ductwork or behind walls, or a moisture meter, to detect moisture in building materials, may be helpful in identifying hidden sources of fungal growth and the extent of water damage.”¹ Thermal imaging can also be used to look for gaps in

insulation and can be useful in predicting areas in the building where condensation will likely form, areas susceptible to freeze/thaw cycles, etc. If dampness/high humidity is a possible cause, a hygrometer should be used to measure relative humidity.

B. Bulk/Surface Sampling

Bulk or surface sampling is not always necessary, and should not be done indiscriminately. It should only be undertaken when the IH/IEP has a hypothesis or theory that sampling results will help him/her answer. Such sampling is seldom needed for relatively small jobs such as those in homes and other residential settings. If samples are collected, it is important that the right kind of sample is collected and analyzed with the appropriate method that will yield meaningful results. Therefore, be sure to follow these caveats:

- Do not collect samples if you don't know what how to interpret the results
- Do not collect samples if the results will not add any useful information
- If you do collect samples, always call an AIHA EMLAP accredited lab⁶ first to discuss the type of information that you hope to gain, and check to make sure that the particular sampling method you are planning to use will give you what you are looking for.
- Do not sample if the results will not affect your remediation plan.

For more information about testing, refer to the CT DPH fact sheet, *Indoor Air Quality Testing Should Not Be Your First Move*⁷.

C. Air Monitoring

1. The same caveats mentioned above for bulk and surface samples apply to collecting air samples for fungi. Samples should not be collected indiscriminately, but only by an IH/IEP to support or refute a hypothesis. Such sampling is seldom needed in homes or other residential settings. Professional judgment based upon experience and training should guide the IH/IEP who uses air sampling judiciously as a tool. Communication with an AIHA EMLAP certified laboratory is highly recommended *before* samples are collected. This is to ensure that the proper collection and analytical methods will be used on a particular job to yield meaningful results for the project.

2. There are no standards for comparison with any air samples collected for microbial agents. Data must be evaluated by an IH/IEP within the context of the entire investigation. Decisions about whether to clean/remediate are almost never made based solely upon air monitoring data.
3. Air monitoring may be useful if the presence of mold is suspected (e.g., musty odors) but cannot be identified by visual inspection due to hidden mold, or colorless or light colored fungi which may not be visible to the naked eye, or bulk sampling (i.e., bulk sampling for hidden mold). The purpose of such air monitoring is to aid in determining the location and/or extent of contamination.
4. Air monitoring may be necessary if there is evidence from a visual inspection or bulk sampling that 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.
5. If air monitoring is performed, for comparative purposes, outdoor air samples should be collected concurrently at a building supply air intake if possible, and at a location representative of outdoor air. For additional information on air sampling, refer to the American Conference of Governmental Industrial Hygienists' book, *Bioaerosols: Assessment and Control*⁸.
6. Post remediation sampling results are almost never zero. This is because mold is everywhere. Even after a thorough cleaning, some mold normally found outdoors will likely migrate into the area as soon as the remediation is complete. The goal of remediation stated in IICRC S520 is to return a condition 2 or 3 site to that of condition 1 (normal fungal ecology). Refer to the Remediation section (section 6) of this document for definitions.

D. Analysis of Environmental Samples

CT DPH recommends the use of laboratories accredited by the American Industrial Hygiene Association's Environmental Microbiology Laboratory Accreditation Program (EMLAP) to analyze viable and non-viable air samples and bulk/surface samples for bacteria and fungi in indoor environments. Participation in EMLAP ensures that the lab uses documented quality controlled procedures, and participates in quarterly proficiency testing.⁶

There are some specialty procedures that the IH/IEP may choose, because he/she feels that they may add information that they cannot obtain from culturable or spore trap sampling, or bulk or swab sampling. Some of these specialty

procedures include QPCR (quantitative polymerase chain reaction), ergosterol as a measure of fungal biomass (for large-scale buildings and research projects) and endotoxin (for gram negative bacteria, which may also be present during floods). Laboratories with a great deal of experience should be used to perform these analytical procedures. They are often university, government, or research laboratories. IH/IEPs desiring to include some of these specialty procedures as part of their sampling plan on mold abatement jobs are encouraged to call CT DPH, Environmental and Occupational Health Assessment Program, Indoor Environmental Quality Unit at 860-509-7742 *prior to the start of the job* to discuss this further.

6. Remediation

The intent of the *Connecticut Guidelines for Mold Abatement Contractors* is not to write a technical procedures and practices document, but rather, to refer readers to documents containing this technical information, such as the *IICRC S520*⁵ and *NYC Guidelines*¹. We point to differences in approaches, and call the readers' attention to key points that mold abatement contractors should be aware of.

The goal for remediation should be:

- To eliminate visible mold
- To reduce hidden mold
- To restore the microbial composition to that normally found in ambient outdoor and non-affected indoor areas

A. Factors to Consider When Planning Mold Abatement

Indoor mold problems arise from water problems. *Knowing whether the water problems are chronic, or a one-time occurrence helps inform how the remediation project will be designed and executed.*

An interdisciplinary approach is often required in order to perform mold abatement. For example, Heating, Ventilation, and Air-Conditioning (HVAC) engineers, hospital infection control practitioners, and facilities engineers may all be a part of the remediation planning team, depending upon the setting.

Note that other types of abatement work (i.e., lead and asbestos abatement) often include water sprays and/or misting for dust control. However, on mold abatement projects, an important goal is to dry out the environment to prevent mold from propagating. Professional judgment must be used based upon training and experience when deciding upon the best method(s) for dust control on a mold abatement job, but consideration should be given to HEPA (high efficiency particulate air) vacuuming in place of, or in conjunction with the judicious use of light misting to suppress dust in the work area. Refer to the most recent edition of *IICRC S520*⁵ for further information.

A. Determining Scope of Work

The most common method for determining the scope and safety precautions to be used in a mold abatement project is to estimate the size of the contaminated area by visual inspection. This method is used in both the NYC and EPA Guidelines^{1,2}. The “size of contamination” concept has gained popular acceptance because it is easy to understand and communicate, and is workable if the water damage is stopped and handled right away, within the first two days. However, if the water is not stopped and the property is not dried out thoroughly within 48 hours, mold will grow, and can infest porous surfaces. The problem with the “size alone” concept is several fold:

- It does not take into account the possible presence of hidden mold. If the water caused a significant amount of damage, and the area remained wet/damp for more than 48 hours, there is a good likelihood that mold is growing in both places that are visible and behind/inside visible areas (such as wall cavities, attics, crawl spaces, etc.).
- The “size alone” concept does not take into account special populations/settings such as hospitals, nursing homes, rehabilitation facilities, same-day surgery centers or other medical treatment facilities, or private residences where a chronically debilitated patient lives.

Rather than relying upon “size of contamination” for project planning, the IICRC S520 [voluntary] *Standard and Reference Guide for Professional Mold Remediation*⁵ uses the terms *Conditions 1, 2 and 3* to define indoor environments relative to mold. A table comparing/contrasting this approach with the size of contamination approach described in the NYC Guidelines is presented below.

IICRC S520 ⁵	NYC Guidelines ¹ <i>(Note that the NYC Guides refers to active growth)</i>
<p><u>Condition 1 (normal fungal ecology):</u> An indoor environment that may have settled spores, fungal fragments or traces of actual growth whose identity, location and quantity are reflective of normal fungal ecology for a similar indoor environment.</p>	<div style="border: 1px solid black; width: 60px; height: 60px; margin: auto; display: flex; align-items: center; justify-content: center;">N/A</div>
<p><u>Condition 2 (settled spores):</u> An indoor environment that 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.</p>	<div style="border: 1px solid black; width: 60px; height: 60px; margin: auto; display: flex; align-items: center; justify-content: center;">N/A</div>
<p><u>Condition 3 (actual growth):</u> An indoor environment that is primarily contaminated with the presence of actual mold growth and associated spores. Actual growth includes growth that is active or dormant, visible or hidden.</p>	<p><u>Level I: Small Isolated Areas</u> (10 sq. ft or less) - e.g., ceiling tiles, small areas on walls</p> <p><u>Level II: Mid-Sized Isolated Areas</u> (10 - 30 sq. ft.) - e.g., individual wallboard panels.</p> <p><u>Level III: Large Isolated Areas</u> (30 - 100 square feet) - e.g., several wallboard panels.</p> <p><u>Level IV: Extensive Contamination</u> (greater than 100 contiguous square feet in an area)</p>
<p><u>Section 11 of S520</u> (December 2003 version): HVAC Remediation</p>	<p><u>Level V: Remediation of HVAC Systems</u></p>
<p><u>Section 12 of S520</u> (December 2003 version): Contents Remediation</p>	<p><u>Contents Remediation – not covered</u></p>

CT DPH recommends that for general purposes, mold abatement contractors employ the IICRC S520 method to describe the scope of their remediation project. It may be desirable to use the “size of contamination” approach as ascribed to in the NYC and EPA guidelines to help decide upon the initial type of containment to be used (i.e., source containment, local [mini], or full scale containment). Be prepared to expand the type of containment used if additional contamination or hidden mold is found.

Although the majority of technical procedures and practices are covered in IICRC S520 that CT DPH recommends mold abatement contractors follow, there are several specifics in S520 that warrant special attention:

- When performing structural remediation, the contaminated area must be isolated from non-contaminant areas to prevent cross-contamination. This usually involves building a barrier or containment structure, usually made with polyethylene sheeting. The containment structure should be checked to make sure that it does not leak, is strong enough to withstand the number of negative air machines that will be placed inside, and if pressure differentials are lost, containment flaps will close so that contaminated materials remain inside of the structure. Experience and training will help guide the contractor regarding size and construction of containment, *but be prepared to expand the containment structure when additional mold is found (i.e., hidden mold), and the scope of the project is expanded.*
- If abrasive tools are to be used, the abatement contractor should establish HEPA filtered negative air in the workspace. This limits the potential spread of contamination
- “Physically removing mold contamination is the primary means of remediation”⁵. This means that it is not acceptable to simply spray a product over mold to cover it up. Indiscriminant use of antimicrobial products, coatings, sealants, and cleaning chemicals is also not recommended. They may be used as complimentary tools on certain surfaces *after the mold has been removed.*
- Mold resistant coatings/sealants should not be sprayed on top of actively growing mold.
- Fungicidal coatings (those rated to kill mold) should not be used as sealants or encapsulants on active, viable mold.
- The use of antimicrobial agents in the form of fogging agents is not recommended for mold remediation in buildings. These are gas or vapor-phase antimicrobials that, by the nature of the delivery system, do not offer enough concentration and contact time to be effective at killing mold. Other problems include toxicity, inefficient capture rate, and the fact that physical removal is still necessary after fogging.
- Biocides are useful in treating indoor environments flooded with raw sewage^{5,9}.

7. Remediation of Heating, Ventilation, and Air-Conditioning (HVAC) Systems

IICRC S520, Section 11 is devoted to the remediation of HVAC systems. This section refers to the National Air Duct Cleaners Association’s (NADCA) document, *ACR 2006: Assessment, Cleaning, and Restoration of HVAC Systems*¹⁰. This document has become an industry standard. CT DPH recommends that mold abatement contractors engaged in remediation of HVAC systems follow S520 section 11 (or appropriately re-numbered

section in future revisions) document thoroughly, and refer to NADCA ACR 2006 for further technical information.

As mentioned above, the majority of technical procedures and practices are covered in the IICRC S520 that CT DPH recommends mold abatement contractors follow. However, there are a few key points in S520 that warrant special attention:

- Isolating HVAC components from other parts of the building that are undergoing abatement is recommended.
- Use of biocides in HVAC systems is discouraged. If there is a fungal infestation inside of ducts or other HVAC components, *the mold must be physically removed*. It is not appropriate to spray antimicrobial products, coatings, sealants or encapsulants on top of viable or non-viable mold in HVAC systems.
- Use of coatings & sealants prophylactically, (during new installation or new construction) or as a final treatment post-remediation as a lockdown for residual particulate & to provide a smooth, clean surface to deter future fungal activity may be of some value.

8. Health and Safety, Hazard Communication

S520 refers to pertinent OSHA Standards for occupational health concerns, including the OSHA General Duty Clause, Emergency Action And Fire Protection Plans, PPE, Respiratory Protection, Asbestos, Lead, Heat Disorders And Health Effects, Confined Spaces, Hazard Communication, Lockout/Tagout, Fall Protection, Noise Protection, And Scaffolds. All of the OSHA standards should be followed during any remediation work.

Contractors that get involved in mold abatement are likely to encounter asbestos and lead on the job at some point. CT DPH has specific regulations for each of these substances. Mold abatement contractors must follow all state regulations pertaining to asbestos and lead. To obtain further information, contacts within CT DPH for each program are provided below. The main web address is <http://www.ct.gov/dph>. The websites for programs may be found in the Environmental Health Section

CT DPH Asbestos Program
860-509-7367

CT DPH Lead Program
860-509-7299

9. Conclusion

The *Connecticut Department of Public Health* recognizes the fine work of other guidelines that precede the *Connecticut Guidelines for Mold Abatement Contractors*. We have provided recommended guidelines for contractors performing mold abatement. We refer readers to the IIRCR S520⁵ and NYC *Guidelines on Assessment and Remediation of Fungi in Indoor Environments*¹ for detailed technical recommendations for most of the technical and procedural specifications needed to perform mold abatement work in a manner that protects building occupants, the abatement workers themselves, and the building structure. We remind readers to keep in mind the basic tenets of mold in indoor environments described in section 3, and conclude by reminding readers that in accordance with Public Act No. 06-195, *An Act Concerning Revisions To Department of Public Health Statutes*, Section 40, the *Connecticut Guidelines for Mold Abatement Contractors* are not to be deemed as regulations.

Acknowledgements

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For further information regarding this document, please contact the Connecticut Department of Public Health, Environmental and Occupational Health Assessment Program at 860-509-7742 or visit our website: <http://www.ct.gov/dph>.

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