TYPES OF MOLD TESTING

There is a variety of tests available to detect (what type) and quantify (how much) mold contamination. While there is a tendency in our society towards scientific precision and detailed measures – number crunching, the first step in evaluating the type and degree of mold contamination is the use of three of our six senses. Generally, our (eyes) visual sense, (nose) olfactory sense, and (brain) common sense are all one needs to tell the difference between contaminations (mildew) that are a nuisance in the shower and a potential hazard (mold) in and behind wall-paper and sheet-rock or by-the-tub mold in the wall.

It is important to remember that there can be a large difference in sense of smell from one person to the next. It is often believed that women have a more acute sense of smell than men and the same inference applies to non-smokers vs smokers. Another consideration is the fact that exposure to fungal contaminants, even at low levels, can sensitize some people so that they experience greater symptoms even with decreasing or low mold exposures. Therefore, some people can experience symptoms when concentrations of spores in the air are low enough that no tell-tale musty odor or moldy smell is present. This variability in human perception of airborne contaminants is one of the reasons why testing can be so important. ∆ Choosing the type of test one uses, however, can be just as important as choosing to test. ∆

Three basic scenarios that you can apply to testing for mold –

1. You may see visible mold.
2. You may not see mold but you may identify one or more “风控”s. 8
3. You may not see visible mold nor “风控”s.

Table 1 on page 14 outlines which types of mold testing might be performed under these three scenarios – as a part of a comprehensive inspection. The testing method(s) selection depends on the situation and the information that is desired and Table 1 represents only a “rule of thumb” approach. If one is mostly concerned with identifying

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8 “风控” Red flag – see page 10 for examples signs of mold growth.
the type(s) of mold present (Scenario 1), then the swab test and/or Bio-Tape® is indicated. If one is concerned with identifying how much mold (Scenario 2), then air testing may be required. If one sees one or more “Po”s, such as a wet wall or carpeted floor area, then testing those areas and/or the air may be indicated.9

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9 Scenario 3 calls for an air sample of uncleaned carpet when there isn’t any sign of mold or any “Po”s. Carpets contain a “history” of exposure.
There are more qualifications to Scenario #2 and #3 in Table 1 on the next page. First, another tool at your disposal – the Temperature/Humidity Meter (sometimes called a Moisture Meter). This meter comes in a variety of shapes, sizes, and prices. Some of these meters are invasive (prongs that go into the substrate surface) and others are not (they read the ambient air in the room).

The views of the ambient air T/H Meter shown on the right give you the Temperature (°F and °C), Relative Humidity (RH)\(^{10}\), Dew Point temperature (DP)\(^{11}\), and Wet-Bulb temperature (WB)\(^{12}\) along with Min/Max record-keeping. It’s 4 AAA battery life is 200 hours. **2007 cost:** $200. Tools like the moisture meter can provide it’s user with positive indicators for mold growth – high temperature and high humidity.

The next qualification is the use of Petri Dish Testing w/swab which has been added to the first column of mold testing options in Table 1. You can pay a Certified Industrial Hygienist (CIH) to do this or you can risk (liability) doing it yourself (using a $12.95 home test kit like this one).

\(^{10}\) RH = The ratio of the amount of water in the air at a given temperature to the maximum amount it could hold at that temperature; expressed as a percentage (%).

\(^{11}\) DP = For a given atmospheric pressure, it is the temperature at which moisture begins to condense in the form of tiny droplets.

\(^{12}\) WB = A thermometer with a bulb that is covered with moist muslin – the higher the WB reading, the higher the humidity.
The final qualification to Table 1 is “Behind-the-Wall Air Sampling” which has been given its own category even though it is indoor air sampling. An example of this sampling setup is pictured below.

This $1,495 air sampling kit contains a non-viable bioaerosol impactor w/adaptor cap, IAQ (indoor air quality) pump w/rotameter, slides (refill = 25 w/5 mailers - $69.95), wall probes (refill = 10 - $14.95), vinyl tubing, stud finder sensor, hand drill w/1/4" bit, vacuum dust cassettes (not shown; refill = 10 - $69.95) for sampling surfaces/carpet, sampling stand, and a case. A micro-cassette (not shown) can be substituted for the stainless steel impactor.

This sampling setup can be modified for vacuum carpet sampling as well as air sampling using micro-cassettes.

### Table 1: Mold Testing Options (Scenarios 1 – 3, page 11)

<table>
<thead>
<tr>
<th>Conditions Observed</th>
<th>Swab/Bio-Tape/Petri Dish Sampling</th>
<th>Indoor Air Sampling</th>
<th>Outdoor Air Sampling</th>
<th>Behind-the-Wall Air Sampling</th>
<th>Carpet Air (Vacuum) Sampling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visible Mold</td>
<td><img src="https://example.com/checkmark.png" alt="Checkmark" /></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Visible Mold; Red Flags</td>
<td><img src="https://example.com/checkmark.png" alt="Checkmark" /></td>
<td><img src="https://example.com/checkmark.png" alt="Checkmark" /></td>
<td><img src="https://example.com/checkmark.png" alt="Checkmark" /></td>
<td><img src="https://example.com/checkmark.png" alt="Checkmark" /></td>
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<td><img src="https://example.com/checkmark.png" alt="Checkmark" /></td>
<td><img src="https://example.com/checkmark.png" alt="Checkmark" /></td>
</tr>
</tbody>
</table>

13 A type Indoor Air Sampling.

14 A type Indoor Air Sampling.
MOLD TRAINING: AWARENESS

INDOOR AND OUTDOOR AIR SAMPLING

Although it can provide extremely valuable information, air sampling is not an infallible means of determining the existence or extent of a mold problem and it must be coupled with a detailed inspection. Indoor air samples should be conducted anytime a "PB" is identified and no mold has been observed. All samples are sealed, marked, entered on a "chain-of-evidence" document, and sent to a certified lab for analysis.¹⁵

1. Air Sampling set up with a non-viable bioaerosol impactor. 2. Inside the impactor, showing the slide. 3. A micro-cassette, in this case a Cyclex-d, can be used instead of the impactor.

When using Petri (culture) dishes for air sampling, the viable bioaerosol impactors that hold them come in various sizes and shapes depending on how many "stages" there are. Each additional stage after the first one captures smaller and smaller and smaller spores.

¹⁵ Indoor air sampling may also be used to attempt to identify and quantify mold in the air in an effort to predict PPE requirements, particularly respiratory protection, for workers performing mold maintenance or remediation. At this time of this writing, no respiratory protection standards have been developed by OSHA, NIOSH, ACGIH, or ANSI. In place of standards, workers are faced with recommendations and professional judgment.
Using a Petri (culture) dish means you intend to create a viable culture – grow bioaerosols (including mold) and identify the contaminants. There are other sampling methods and instruments not discussed in this brief unit.

Carpet Sampling – A special vacuum dust cassette is used to collect this air sample from carpet within the cardboard template.

Normally, outdoor air monitoring should be conducted as soon as possible to the time indoor air sampling is to be conducted. Since most mold that ends up inside buildings originated outside, it is necessary to compare the results of inside-outside tests. If the inside/outside tests show similar types and levels of mold spores, then the problem may not be in the building itself. The spores could be entering when building windows and

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16 Using a Petri (culture) dish means you intend to create a viable culture – grow bioaerosols (including mold) and identify the contaminants. There are other sampling methods and instruments not discussed in this brief unit.
doors are opened.

**For Reference**

Micron (or micrometer) = \( \mu \text{m} \) or 1 millionth of a meter  
39.37 inches = 1 meter  
Therefore 1 \( \mu \text{m} \) = 1/25,400 inches

The smallest object visible to the naked eye under normal light is about 50 microns. In very bright light, people may be able to see objects as small as 25 microns.

Human hair ....... the finest is about 30 microns in diameter  
the coarsest is about 200 microns

The finest sand grains are 20 – 200 microns  
Beach sand grains are 90 – 2000 microns  
A dot from a pen on paper is about 100 microns

So –

![Diagram of particle sizes](image)

- Debris and other particles visible to the naked eye
- Heavy atmospheric dusts
- Flyash
- Mold, Pollen
- Average atmospheric dusts
- Bacteria
- Light atmospheric dusts
- Tobacco smoke
- Bacteria
- Metallic fumes
Aerodynamic size can be different than physical size as seen under a microscope. These sizes appear to be smaller than the generalized sizes on page 17.

Examples of Aerodynamic Sizes

- Streptomyces albus: 1.0 μm
- Thermoactinomyces vulgaris: 0.6 μm
- Mycobacterium bovis: 0.9 μm
- Aspergillus versicolor: 2.4 μm
- Cladosporium cladosporioides: 2.1 μm
- Penicillium brevicompactum: 2.2 μm
- Stachybotrys chartarum: 4.2 μm

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17 Aerodynamic size can be different than physical size as seen under a microscope. These sizes appear to be smaller than the generalized sizes on page 17.