

11/11/19

## A Guide to DIY mould assessments & removal

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### Building related illness risk assessment

Those suffering Chronic Inflammatory Response (CIRS) or Environmentally Acquired Illness (EAI) will often request assessment of current homes or potential homes. There are many ways of undertaking this, but accuracy will always depend on expenditure regarding sampling and analysis.

With no set levels of safe exposure to mould or biological toxins it is recognised that different people with different genetics or immune response will see different levels of health impact. At Building Forensics, we combine the skills of the professionally competent Indoor Environmental Hygienist with practical building related science.

Many may decide to DIY assessments with ERMI and perhaps moisture meters. The following table provides some answers to typical questions we receive, and I hope it may assist you.

There is unfortunately, a belief that wet materials are mouldy materials, but the reality is mould prefers damp NOT wet materials and the development of mould is reliant on several environmental factors quite apart from moisture. More importantly the type and composition of substrate will affect the type of biological amplification and most importantly, invariably mould is not the most significant risk factor but can sometimes be an indicator of health risk. The following table shows typical questions we are often asked to answer.

Question	Answer
Is the property safe?	Without extensive intrusive investigation and substantial sampling and analysis of surfaces, air, it impossible to state
If I spend substantial sums on analysis will it provide a definitive safe or hazardous for me?	We have no idea, due to varying genetics (typically HLA gene) and the level of your immune system it may be safe for you but not the atopic population. This is supported by peer reviewed medical literature.
What is my best option for risk assessment of my property	With NO international or UK standards of maximum exposure levels numbers of spores or types of mould is almost irrelevant. I say almost but distribution and species are a good indicator when coupled to other relevant information and controls.
If it is damp or wet is it a hazard	No but it may be a risk
We had a leak, but it dried naturally is it OK now?	Definitely not, historic water damage that was allowed to dry naturally is likely to be more hazardous than current water damage.
If I buy a moisture meter and I find surfaces are dry is it safe.	If it was ever wet there was probably bio amplification. Current moisture content has no relevance.

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	Damp or wet areas however can form part of the overall risk assessment. Dry now doesn't mean there isn't mould contamination present
My humidity meter says its only 60% but I know mould only grows at 70% Rh and the temperatures is above 20C	Mould grows in refrigerators where temperatures and humidity are very low. Its often NOT moisture content but surface molecular activity that triggers mould growth and this is coupled to nutrients available from typical organic materials.
I want to know if the mould is Stachybotrys	This black mould is not the only potentially toxic species. There are many that grow in homes which are far more toxic especially synergistically. More importantly colour is no indication of risk.
Could the mould be affecting my health?	All mould is allergenic, but some are toxic and these can cause inflammatory response NOT just allergic response. It may be important to identify the differences by professional sampling techniques
I have visible mould growth can you tell if its toxic.	A waste of money. If it's not toxic, it's still a health hazard and if it's been there more than 6 weeks growing on a cellulose substrate (plasterboard, wall paper) it most likely is, potentially toxic.
I have put out culture plates and they came back (high or Low) What does it mean?	This type of sampling does NOT conform to British standards and the World Health Organisation states this method and all culture-based sampling "Has Serious Limitations" this type of sampling is almost worthless.
I have an ERMI score of 1 or 10 is that safe?	The ERMI test was patented by US government Environmental Protection Agency (EPA). It looked at the average mould levels in 1096 USA homes. These homes in different states and of different climate and construction to UK are therefore meaningless. Moreover, even in USA the EPA state the ERMI " <b>MUST NOT be used for health impact assessments</b> " as it was not developed or has significant use in this field. Building Forensics do use data from the QPCR-DNA to make health impact assessments from samples we take.
I have high mycotoxins in my urine is that significant?	Ask your doctor, but we & or our colleagues in USA struggle to find the mycotoxins in homes of these high-test results. We can however usually identify the mould species that can produce these secondary metabolites called Mycotoxins
If I measure high or low levels of moisture in my home is that enough to tell me if the home is safe	Absolutely not. It could be dry after water damage but there will still be mould presence especially in interstitial cavities, and behind wallpaper, under floors and in walls, ceiling cavities
The mould was sprayed with fungicide, biocide or magic formulae.	Absolutely no chemical treatment available will destroy mould. It may temporarily remove it but it will almost always return unless other actions are taken. Mould has been boiled, steamed exposed to high levels of gamma radiation on International Space station and immersed in bleach for an hour. Still grows but becomes more toxic. Dead mould is more hazardous than live mould (WHO)
The mould is dead is it now safe?	Unfortunately, according to WHO dead mould desiccates and fragments and can now by pass all human defences in the 5 micron size. Below 7.5 micron the mould fragment can pass directly into the blood stream where it's effects can be increased by a factor of 40 times. (WHO)
Contractors have provided a quote to remove mould and decontaminate my property using XYZ process. Will it work?	I very much doubt it will work as they claim whatever XYZ is. There is a simple test as to their integrity or honesty. Tell them a professional Indoor Environmental Hygienist will be undertaking post treatment sampling and they will only get paid if the results are as they state. I suspect they will walk away or say

	we are scare mongers.
Is temperature and humidity monitoring a good guide to prevent mould growth	Unfortunately, no. There could have been water damage before the monitoring. There could also be dew point condensation in cavities which are NOT monitored, and mould growth can be there.
I am going to buy a new home is this the safest option?	About 25% of our clients are new homeowners who became sick after moving into their brand new home. Have you ever seen an umbrella over a building site or stored materials? Mould is almost inevitable in new builds, but builders will usually bleach and paint over prior to sale. That just leaves what's in the cavities and air
I'm going to buy a GREEN HOUSE, is that the safest option?	No, I don't think so. Many have re constituted building materials or are wood based. I have seen some so contaminated, they should be torn down.
I haven't the money for a professional survey, what can I do?	Use your eyes and nose to inspect for current or historic water damage. See if your health worsens and move out if it does.
Which is the worst mould for health impact?	Some moulds may be inert or dormant but when in competition with other moulds and bacteria combine and create a very toxic exposure in the air.
Is mould the only health issue in a property?	No. Bacteria are now considered to rival or perhaps even increase the health risk. Gram positive and negative bacteria usually grow within 48 hours of water damage. Mould and bacteria are natural enemies and have produced chemical warfare agents to combat each other.
Are VOCs (Volatile Organic Chemicals) a health hazard? Should they be tested?	Yes, possibly the only UK legislation covers some of the gases we identify in buildings. They range from formaldehyde to Sulphur dioxide, carbon monoxide and of course carbon dioxide levels can be a great indicator of healthy air and ventilation. Testing VOCs while having a professional survey should only add a little to costs.
My property is at 22C and only 60% and because that's below the trigger 70% I won't get mould growth, will I?	Unfortunately, this is a misconception. The amount of moisture in the air at these levels is approx .0010 grams/kg of dry air. Typically, the ambient or outside air in UK is less than .0006g/kg. Therefore, the air is wet and can condense on cooler outside wall surfaces or cavities and result in mould growth. You would have to reduce the temperature to approx 14c to reduce the risk and of course this is impractical but indicates a moisture management issue. Here Dew Point is the significant issue for mould growth,
If I install a good quality air cleaner will it reduce my exposure.  See Video link	The simple answer here is a little. Unfortunately, the machines on floor level generally only collect the heavier whole spores which fall out of the air through gravity. The smaller lighter spore & Hyphae fragments remain airborne for much longer due to the laws of physics and they are constantly re circulated through simple movement of walking and opening doors. These are in your breathing zone. See one of the best air cleaners on the market only pulling air in from floor ( <a href="#">video</a> )
If my ERMI is really low, is that good?	Its better than really high but it has no relevance to building related health issues and there are many potential flaws in DIY sampling.
How important are bacteria in building related illness?	Some forms of bacteria may pose a higher risk than mould with regards to inflammatory response. The sampling for gram positive and negative bacteria should be a major issue with health risk assessments, although initial investigation may exclude this unless requested by the medical profession and or Nutritionist. These bacteria colonise before mould.
Will infra-red scan tell me if the	Absolutely not. IR scans in the hand of a qualified technician can

property is wet?	show Delta t ( $\Delta t$ ) which is differences in temperature and indicates poor insulation, air drafts and or moisture differences causing he substrate to cool. It is often used as a first step to moisture mapping.
I have high moisture readings on a dry wall, why is this?	The average moisture meter has two pins and is calibrated for wood. When used on some other substrates they can record 100% wet even when stone dry. Moisture readings other than for wood are difficult for the untrained to analyse. Many building materials have components that provide false positives
A contractor has been recommended for mould decontamination, and remediation. How do I know if they are qualified and competent?	Ask in writing: To see their certification and who issued it. Was it a supplier/manufacturer or a recognised training program? Ask how long the training took and ask all questions in writing and get response in writing. If they have misled you, inform Trading Standards
A decontamination process has been recommended which is said to be used in hospitals. Is it OK?	I doubt any decontamination protocols used in hospitals are available to the public. I have seen similar claims which turned out to be a trial but never used again. Ask them for their successful decontamination protocol and certification and if it involves assessing mould growth on cultures, ask what of fragments which don't grow but are more harmful, be suspicious
If I remove mould from surfaces is that sufficient?	No, once mould is present it will release spores into the air you breathe and that's generally what makes people sick. Touching mould during clean up will see thousands of spores released. One cubic inch of mould is said to be a billion spores
I did an ERMI but the score is very high or very low, what does it mean?	ERMI testing usually provides misinformation when poor sampling techniques are used. Often the microbial profile does not show the complete exposure risk.

### Decontamination DIY

There are two basic forms of decontamination, surface and air.

In all cases surface decontamination is simply cleaning and even those with mould sensitivity can DIY if properly protected.

The air cleaning is a more complex, most filter machines only provide cleaning at low levels and not up at breathing zone (face height)

Typically a chemical conglomeration process will cause airborne particulates to fall out of air (see [www.airscrub.co.uk](http://www.airscrub.co.uk)) Note. Owned by Building Forensics.

The general advice is to wear a FFP1 or P3 mask, goggles and gloves but this is simply inadequate, and the following explanation may assist in risk management.



### **MAGIC Mould killers**

We are often told contractors use or recommend a chemical that is used in hospitals and can kill mould and bacteria on contact.

Its simply not true and a review of evidence produced by manufacturers will usually show this.

**The only recognised mould treatment is removal**

### **Typical removal**

All government agencies follow CDC and US government advice and this includes NHS

The advice is, *“if there is less than 10 square feet of mould, you can undertake removal yourself”*

They advise personal protective equipment (PPE) which from below you will see is usually inadequate, but basically when suitably protected, wash off mould with soapy water.

### **Your exposure risks**

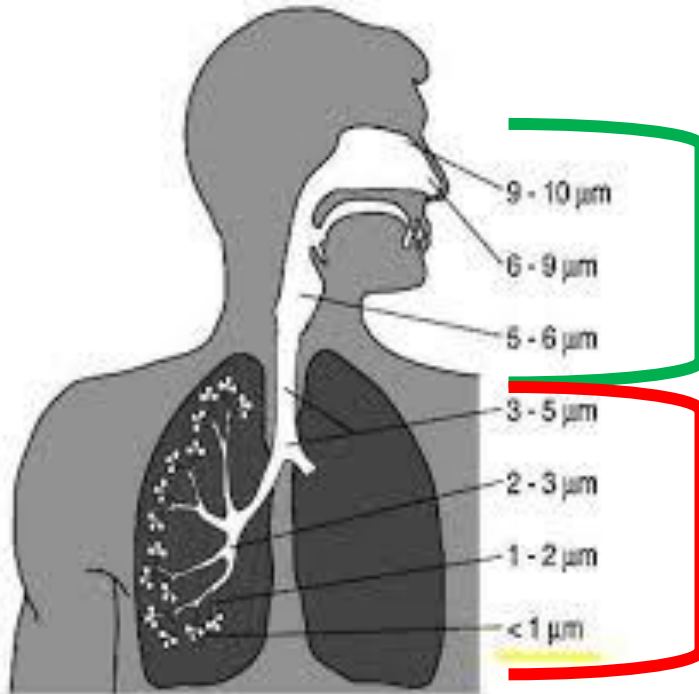
Mould spores are typically sized between 10 and 20 microns

Dead mould caused by chemical application (bleach, fungicide), drying out cause's desiccation and the fragmentation of toxic particles. The diagram below shows typical human defences fail when particles become smaller than 5 microns. Here they bypass human defence in the nose and upper respiratory system (throat). The particles pass down to the lower respiratory system and into the alveoli. This is where oxygen exchange occurs but unfortunately these particles are so small, they act as a gas, and can be adsorbed into the blood stream. This means toxins on fragments are absorbed into the blood and WHO estimate these increase exposure hazards by a factor of 40.

The following diagram 1 shows the bodies typical response to the size of particles you will most likely be exposed to.

It is therefore imperative that you defend against these particle sizes but unfortunately most believe information generally distributed by PPE manufacturers.

Diagram 1



**The penetration and deposition of particles into the lower respiratory system. Limited protection to green zone, but almost no protection in red zone**



This is a typical FFP3 or FP1 particle mask by Dräger  
 This is one of the best manufacturers but this and similar products are completely inadequate protection for DIY mould and biological clean up. It does not protect against VOCs and of course leaks at edges, cannot protect eyes or ears.

In Table 1 below you see the ***Nominal*** protection factors as provided by the manufacturers of ***ALL*** masks. This measurement is arrived at by gluing a mask onto a manikin called a "Sheffield head" which of course doesn't move.

Next to the Nominal protection factors are the ***Assigned*** protection factors and these are developed from measurement during actual use where the face, mouth, neck and jaw move, resulting in leakage (infiltration) .

You will note the dramatic drop in protection in real life testing.

You should also be aware that mould decontamination will see very high numbers of particles so exposure even when using the best FFP3 or similar is certain.

The other issue with mask and goggles is that goggles leak too and their poor fitting and sometimes ventilation holes prevent misting is another route to eyes and body exposure.

With mould an hyphae fragments often chemically contaminated the ears are another route of entry so ear plugs should be worn.

**The solution and Building Forensics recommendation is:**

- Tyveck disposable suit with hood
- Overshoes (polythene)
- Nitrile gloves
- FULL FACE mask with HEPA filter and preferably VOC filter called ABEK
- Ear plugs (used for swimming/noise)
- Consider taping joints with gaffer tape.
- Get a friend to check you out to ensure you are sealed up.



The 3M full face respirator fitted with ABEK cartridges. £78 .83 on Amazon

<file:///C:/Users/User/Desktop/3M%20Reusable%20Full%20Face%20Mask,%20Medium,%206800,%20EN%20safety%20certified%20Amazon.co.uk%20Business,%20Industry%20&%20Science.html>

Wearing this form of PPE may cause fatigue and even fit people should not work more than 4 hours without a powered (air supply) respirator, without rest and re hydration.

Hydration is important as the body will perspire when enclosed so its important to drink lots of water and have frequent rests during the work.

**The failures of PPE**

The following table 1 shows the actual amount of protection masks/respirators provide.

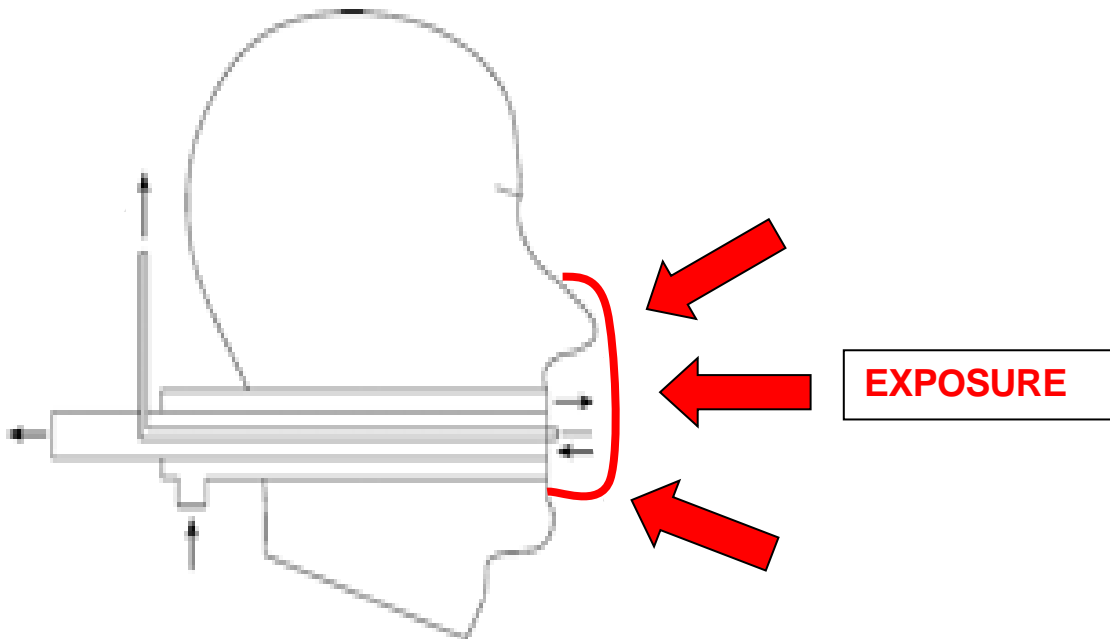
You will note the red numbers which show actual protection factors when measured in use.



Table 1

Standard	Description	Filter class	Nominal PF	Assigned PF
EN149	Filtering face piece for particulates	FFP1	4	4
		FFP2	12.5	10
		FFP3	50	20
EN140	Half Mask	P1	4	4
		P2	12	10
		P3	50	20
		Gas	50	10
EN136	Full face mask All classes	P2	17	10
		P3	1000	40
		Gas	2000	20
EN12942	Power assisted Full face mask	TM1	20	10
		TM2	200	20
		TM3	2000	40

How did manufacturers develop their “Nominal Protective factors”



**This diagram represents a Sheffield Test head.**

You will notice the tube drilled through this rubber head which simulates breathing (in and out).

The red line represents a mask glued onto the face surface around the breathing zone.



The exhaust (at the back of the head) is under vacuum and measured for exposure of contaminants drawn in from the front of the mask.

***Of course, in real terms, masks are not glued on and faces move to create leakage points***



A typical half mask which can leak around perimeter of face contact. This is caused by facial and head movement, beard growth etc.

### **Don and Doff PPE**

Its important your PPE fits properly and commercially if you were an employee you would need to be fit tested .

Common sense prevails here for DIY, and most could or should be able to work out if they have a large, medium or small face and purchase should be made accordingly.

When putting on PPE it should be undertaken in a place which is contained or outside because when you take it off you will release much of the contamination on the outside of PPE.

If you use the PPE again you must make sure it is clean so prepare to decontaminate masks and don't re use gloves and avoid re using paper suits if possible.

Remember to wash hair and skin as soon as possible and remember walking from a contaminated zone in PPE can spread contamination.

From the forgoing you should now be in a position to assess your own risk and hazard exposure and more importantly be capable of undertaking some form of safer decontamination if you cant afford professional help.

If you need more help see our web site or email to book an appointment for a survey

**End**  
**Jeff Charlton**