PURELIVING
Indoor Environmental Solutions

Consulting Results for

HQIS

218 South Yili Road,
Changning District, Shanghai

Advisor: Kimi Shi
PureLiving
Indoor Environmental Solutions

Inspection date:
02 December 2018

Report date:
14 December 2018

Content

Executive Summary

IAQ Testing per GB/T18883-2002:

- All parameters tested (TVOC, formaldehyde, and benzene) were within allowable limits per GB/T 18883-2002. From a regulatory standpoint, indoor tested spaces are safe to be occupied under aforementioned conditions.
    - Maintain a regular ventilation schedule via either fresh air systems or opening windows/doorways.
    - Run active-carbon based air purifiers to filter indoor particulates and VOCs. Regularly replace the filter media.
    - Consider installing indoor air quality monitoring station that can provide real-time information regarding indoor pollutants including PM2.5, CO2, temperature and relative humidity.

TVOC & Carbon Dioxide (CO2) monitoring:

- CO2 levels were over both GB/T18883-2002 standard (1000 ppm) and LEED guideline (800 ppm) during the school hours in L418 classroom, likely due to insufficient fresh air supply, or the fresh air system is off during the monitoring period.
- CO2 levels in other monitoring locations and TVOC in all monitoring locations were within standards during the whole monitoring period.

Mold Testing:

- Mold spores in B1 Theatre were at Low-Medium level per the European Union mold exposure standards. Indoor species are predominantly consisted of *Basidiospores* and *Cladosporium Group C* – two ubiquitous types of fungi mostly found outdoors.
- Indoor spores are likely due to outdoor entrainment as both indoor and outdoor mold spores have the same species.
    - Maintain a regular cleaning schedule. HEPA vacuuming is a recommended method.
    - Indoor moisture control - consider to use dehumidifiers or A/C dehumidification function when levels consistently exceed 55%.

Dust Mite Testing:

- Levels of the two dominant allergens, Der p 1 & Der f 1, were detected to be low possibility to cause allergic symptoms.

Material Lead Testing:

- Lead was not detected in all 3 paint samples.
- Although lead level in wall paints were under detection limit, deciduous wall paint on site may cause particles release and increase indoor particulate levels
    - Repair the walls in classrooms
    - Run HEPA-equipped filter to capture particulates

Background

Situation

Shanghai Hong Qiao International School (HQIS) partially renovated its B2 floor during summer vacation this year. The renovation work stopped when fall term began because of complaints on the smell. Due to students' and employees' health concerns, HQIS would like PureLiving, an independent third party, to conduct a laboratory indoor environmental quality testing to diagnose current indoor pollution levels. Testing is conducted on 4 parts – general indoor air quality, mold, dust mite, and material lead.

Client objectives:

a) Determine if levels of indoor air pollutants are within GB/T 18883-2002 regulatory limits
b) Determine the levels of mold spores in the ambient air in B1 theatre
c) Determine the levels of dust mites in Classroom L118 and L210
d) Determine if levels of lead in paint are within US CPSC regulatory limit
e) Provide recommendations for any issues or potential improvements

Site Description and Sampling Conditions

- School was partially renovated during summer vacation, renovation stopped in September- approximately 3 months prior to testing
- Outdoor conditions:
    - Moderate rain, 21ºC, 86% relative humidity.
- Indoor conditions:
    - Tested rooms/areas are unoccupied at time of sampling
    - On average 22ºC, 70% relative humidity
    - Most windows/doorways closed for >12 hours prior to testing. (GB/T 18883-2002 requirements mandate 12hrs of no natural ventilation). However, a doorway towards after-school classrooms in B1 adjacent to the gym was ajar during sampling
    - A/C off
    - Fresh air systems on regular settings
    - Standalone air purifiers on regular settings

Air Quality Testing Results & Analysis

1. Laboratory IAQ Testing Results per GB/T18883-2002

Test Point	Room Name	Description	TVOC	Formaldehyde	Benzene	Carbon Dioxide	Relative Humidity	Temperature	Sampling Notes
		Units	mg/m3	mg/m3	mg/m3	ppm	%	°C	
		Limits of detectio	0.0005	0.006	0.05	1.00	1	1	
1	Large Cafeteria	B1	0.0480	-	-	-	-	-	Fresh Air On; Standalone Air Purifer on; A/C off.
2	Foyer	B2	0.0378	0.009	<0.05	573	-	-	
3	Gymnasium		0.0454	0.010	<0.05	559	-	-	
4	Theatre	B1	0.1060	0.011	<0.05	-	77	20	
5	Small Cafeteria		0.0258	0.014	<0.05	-	-	-	
6	Art Classroom		0.1680	0.024	<0.05	-	74	21	
7	Oval Cafe	1F	0.1160	-	-	-	-	-	
8	Admission Office		0.1340	-	-	-	-	-	
9	Classroom - L118		0.0719	0.016	-	-	70	22	
10	Classroom - L126		0.0273	0.019	-	-	-	-	
11	Library -L202	2F	0.1140	0.041	<0.05	-	63	22	
12	Corridor		0.0171	-	-	-	-	-	
13	Classroom - L216		0.0242	0.030	<0.05	-	70	21	
14	Classroom - L 221		0.0317	0.018	-	-	-	-	
15	Teachers/Staff room -L 305	3F	0.0556	0.032	<0.05	-	69	23	
16	Classroom - L 307		0.0663	0.030	<0.05	-	-	-	
17	Classroom - L 328		0.0291	0.026	-	-	71	22	
18	Science Lab- L403	4F	0.0816	0.054	<0.05	-	68	21	
19	Trial Room - L407		0.0303	0.019	<0.05	-	68	22	
20	Classroom - L 418		0.0708	0.033	<0.05	-	-	-	
	Average Indoor		**0.0650**	**0.024**	**<0.05**	**566**	**70**	**22**	
	National Standard (GB/T 18883-2002)		≤0.6	≤0.10	≤0.11	≤0.2	40-80	N/A	

IAQ Testing Plan

- Sampling of common post-renovation indoor pollutants that are often found in newly constructed/renovated buildings based on GB/T 18883-2002 – TVOC, formaldehyde, and benzene.
- **20 testing points** were selected (Refer to Appendix B)**:**
    - 2 points on B2 floor (foyer, gym)
    - 4 points on B1 floor (cafeteria, theatre, art room)
    - 4 points on 1F (café, office, classrooms)
    - 4 points on 2F (library, corridor, classrooms)
    - 3 points on 3F (staff room, classrooms)
    - 3 points on 4F (science lab, trial room, classroom)

Results and Analysis

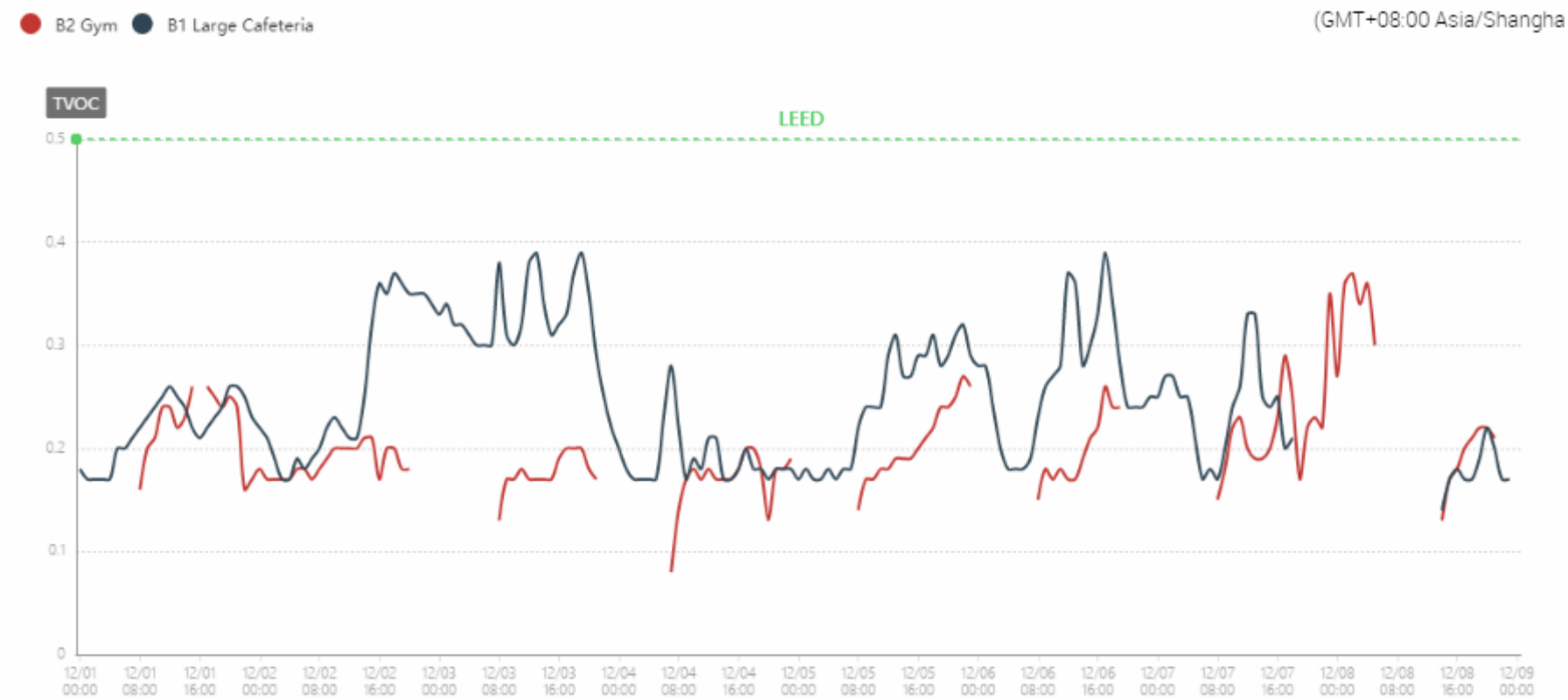
- **TVOC – no points of failure**
    - **Average TVOC level was 0.065 mg/m3 – 11% of the national GB/T 18883-2002 standard (0.6 mg/m3).**
    - The highest TVOC level was found in B1 Floor Art Room (0.168 mg/m3), which is 28% of the national GB/T 18883-2002 standard (0.6 mg/m3). Higher TVOC levels in this room may due to VOCs emitted from pigments and other drawing materials combined with off-gassing from renovation materials.
- **Formaldehyde – no points of failure**
    - Average indoor level was 0.024 mg/m3, 24% of the national GB/T 18883-2002 standard (0.10 mg/m3).
- **Benzene – none detected**
    - Indoor benzene levels were under the Limit of Detection at all points.

IAQ Conclusions and Recommendations

- **Overall, all parameters tested (TVOC, formaldehyde, and benzene) were within allowable limits per GB/T 18883-2002.** From a regulatory standpoint, indoor tested spaces are safe to be occupied under aforementioned conditions.
- The following actions are suggested to maintain the indoor airborne pollutants within a low range:
    - Maintain a regular ventilation schedule:
        i. Open windows/doorways to increase the natural ventilation when outdoor PM levels are low.
        ii. Continually keep the fresh air system to increase the air exchange, particularly on B2 and B1 floors. Regularly clean/replace the filter media per manufacturer's guideline.
    - Run active-carbon based air purifiers to filter indoor particulates and VOCs. Regularly replace the filter media.
    - Consider installing indoor air quality monitoring station that can provide real-time information regarding indoor pollutants including PM2.5, CO2, temperature and relative humidity.

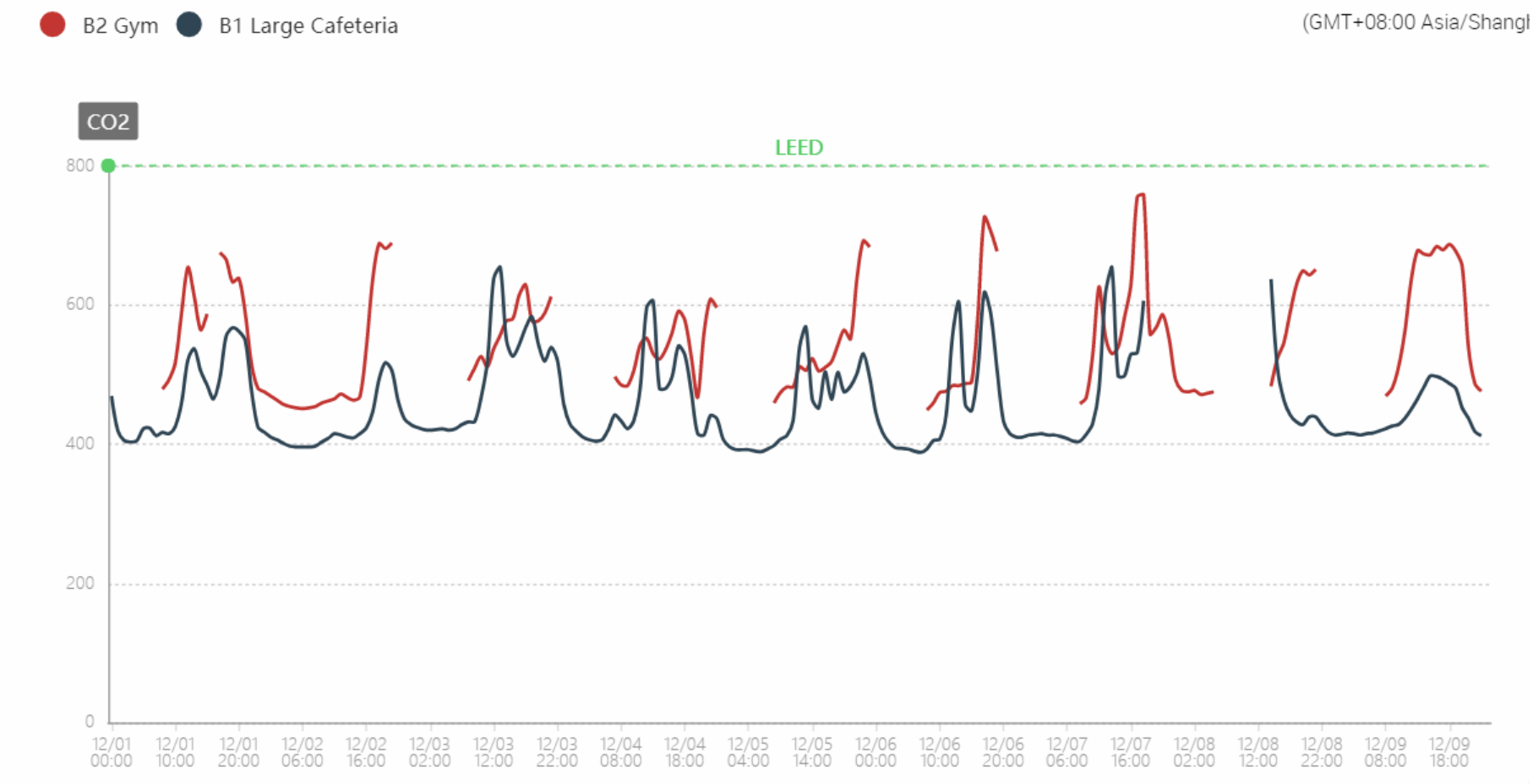
2. Air Monitoring Results

TVOC Monitoring in B1 Large Café and B2 Gym:



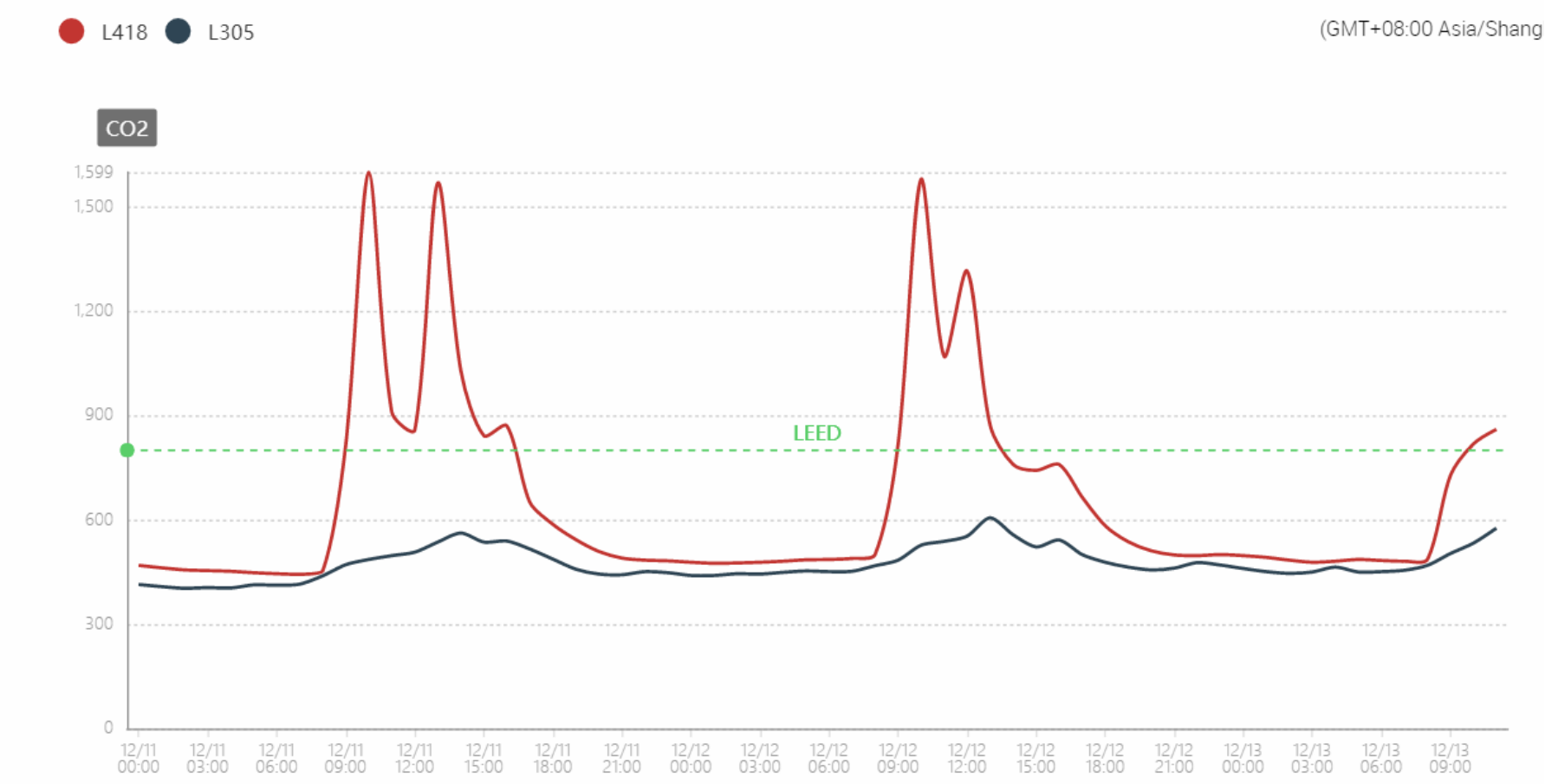
- 1st round of monitoring was conducted in B1 large café and B2 gym, respectively. Overall, TVOC levels in B2 gym and B1 cafeteria were within national GB/T 18883-2002 standard limit (0.6 mg/m3) as well as international LEED guideline (0.5 mg/m3).
- Peak levels in B1 large café usually occurred during mealtimes, indicating food related sources may contribute to the TVOC level, and peaks in B2 gym often happened after school which is likely due to students' activities.
- Data lost mainly occurred after school, which may be due to power failure/network offline.

CO2 Monitoring Results



- Overall, CO2 levels in B1 café and B2 gym were lower than both national GB/T 18883-2002 standard limit (1000 ppm) and international LEED guideline (800 ppm) throughout the whole monitored period, which indicates current fresh air system is efficient in brining outdoor fresh air into basement areas.
- The peak levels in B1 large café occurred mainly at noon, and the peaks in B2 gym often happened in the afternoon, when the areas are occupied.

CO2 Monitoring Results



- CO2 levels were over both GB/T18883-2002 standard (1000 ppm) and LEED guideline (800 ppm) during the school hours in L418 classroom, likely due to insufficient fresh air supply, or the fresh air system is off during the monitoring period.
- Levels in L305 staff rooms were <600 ppm during the monitoring period – well within both standards.

Mold Testing Results & Analysis

QLab, 256 Bridge St, Metuchen, NJ 08840
info@qlabusa.com www.QLABusa.com
AIHA EMPAT Lab ID: 178794

AccuScience™
Analysis Report

Analysis: AccuScience Premium Level 3 Fungal Spore Count™
Client: PureLiving China
Shanghai, China
Contact: Yan, Peijia
Project ID: **Shanghai Hong Qiao International School**
Date Sampled: **12/2/2018**

QLab Job No.: ME181204-05
Date Received: 12/4/2018
Date Analyzed: 12/7/2018
Date Reported: 12/7/2018

Reviewed by: WT **Approved by:** Wei-Chih Tang, Ph.D., Lab Director

Lab Sample No.	ME181204-05(1)			ME181204-05(2)					
Sample ID	**1**			**2**					
Sample Location	**Outdoor**			**B1 - Theatre**					
Sample Type (Device)	Air (Allergenco-D)			Air (Allergenco-D)					
Air Volume	75 L			75 L					
Total Concentration (counts/m³)**	**3,500 cts/m³**			**370 cts/m³**					
Mycologix Profile Group 1, 2 & 3	**cts/smp***	**counts/m³**	**%**	**cts/smp***	**counts/m³**	**%**			
1. Common Dominant Spores	DL = 53; LQL = 1100 cts/m³			DL = 53; LQL = 1100 cts/m³					
Ascospores, non-specified (O)	8	110	3						
Basidiospores (O,I)	125	1,700	49	19	250	67			
Cladosporium, Group HM (O)									
Aspergillus/Penicillium-like, DOT (O)									
#Cluster-Chain-Loose Spore Profile™									
Cladosporium, Group C (O,I)	91	**1,200**	**35**	8	**110**	**29**			
Cladosporium, Group S (I)									
Aspergillus/Penicillium-like (I,O)									
## Cluster-Chain-Loose Spore Profile™									
Cluster(s)									
2. Indoor Hydrophilic Fungi#	DL = 13; LQL = 270 cts/m³			DL = 13; LQL = 270 cts/m³					
Stachybotrys (I)									
Chaetomium (I)									
Ulocladium (I)									
Memnoniella (I)									
Trichoderma (I)									
Scopulariopsis (I)									
3. Others	DL = 13; LQL = 270 cts/m³			DL = 13; LQL = 270 cts/m³					
Hyphal fragment (O,I)	2	27	<1						
Alternaria (O,I)	17	230	7						
Cercospora (O)	1	13	<1						
Curvularia (O,I)									
Drechslera/Bipolaris-like (O)									
Epicoccum (O)									
Fusarium (O,I)									
Myxomycetes/Smuts/Periconia (O,I)	2	27	<1						
Nigrospora (O)	4	53	2						
Pithomyces (O)									
Rusts (O)	7	93	3						
Unknown (O,I)	1	13	<1	1	13	3			
Skin Cells Rating	Trace			Trace					
Debris Rating	3 (26 - 75%)			2 (6 - 25%)					
Note									

*: cts/smp: counts per sample. **: All concentrations are rounded to two digits of significant figures. Total concentrations/percentages may not be equal to the sum of individual concentrations/percentages due to rounding. #: Water-loving indoor fungi (min Aw ≥0.89). Absence of hydrophilic fungi does not exclude the possibility of a water damage history. DL: detection limit (analytical sensitivity). LQL: Lower quantitation limit = 20 x DL. Upper quantitation limit depends on sample conditions. ## Asp/Pen-like spores: Loose: 1 to 2 spores; Chain: 3 to 9 spores; Cluster: 10 spores or more. O: Mostly outdoor origin with rare exceptions; I: Mostly indoor origin with rare exceptions. Distinct Outdoor Type (DOT): Distinct outdoor Asp/Pen spores that can be easily differentiated from indoor Asp/Pen spores. DOT is specific to the batch of samples collected at the same time and cannot be used for other batches.

QLab, 256 Bridge St, Metuchen, NJ 08840
info@qlabusa.com www.QLABusa.com
AIHA EMPAT Lab ID: 178794

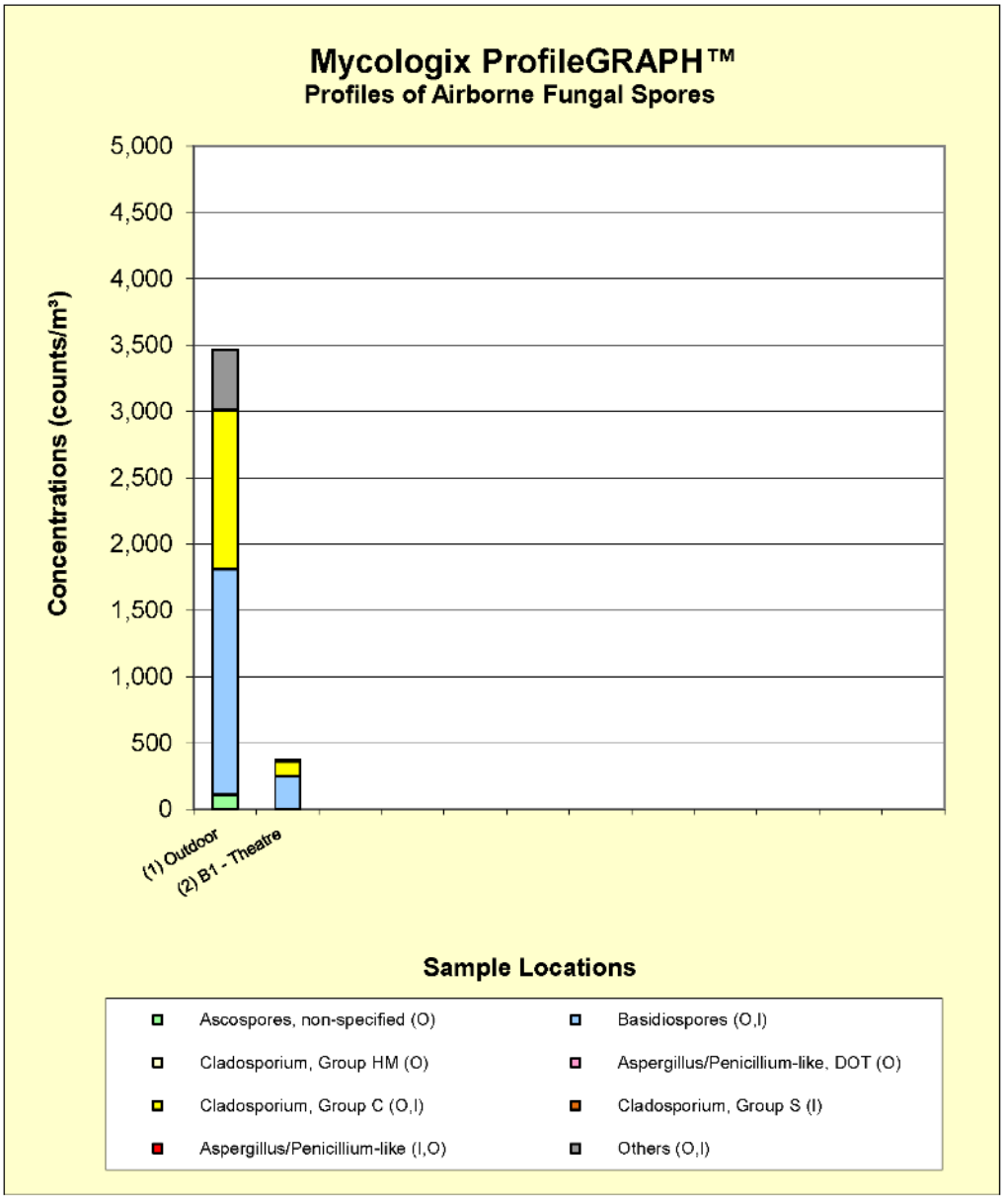
AccuScience™ Analysis Report

Analysis: AccuScience Premium Level 3 Fungal Spore Count™
Client: PureLiving China
Shanghai, China
Contact: Yan, Peijia
Project ID: Shanghai Hong Qiao International School
Date Sampled: 12/2/2018

QLab Job No.: ME181204-05
Date Received: 12/4/2018
Date Analyzed: 12/7/2018
Date Reported: 12/7/2018

Reviewed by: WT **Approved by:** Wei-Chih Tang, Ph.D., Lab Director

Please see original data for complete interpretation.



Mold Testing Plan

Samples taken:

- Outdoor – reference
- **B1 Theatre** – indoor concerned area

Sampling details:

- 75L volume of air sampled
- Height was at 2-4' (ambient air zone)

Mold Testing Results Interpretation

- The air samples indicate the following levels of mold in the tested rooms:

Outdoor	**3,500 cts/m3**
B1 Theatre	**Low-Medium (370 cts/m3)**

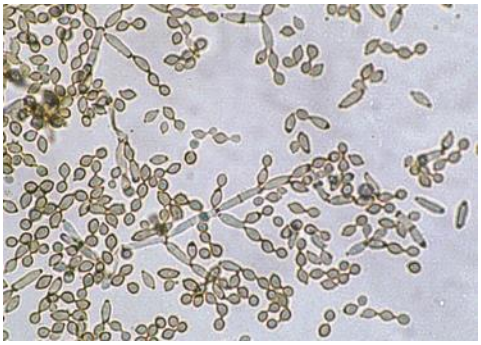
- Indoor mold levels detected in B1 Theatre was 370 cts/m3, and was approximately 11% of the outdoor spore counts (3,500 cts/m3). The indoor level was considered as Low-Medium level per the European Union mold exposure standards. This result indicates no significant indoor mold growth.
- If the spores were carried in from the outdoors, the percentages of types would be similar. Outdoor spores predominantly consisted of *Basidiospores* and *Cladosporium Group C* (49% and 35%, respectively) – two ubiquitous types of fungi mostly found outdoors. Similarly, spores in B1 theatre have the similar proportion as outdoors (67 % of *Basidiospores* and 29% of *Cladosporium*), indicating spores in the theatre are likely due to outdoor entrainment, rather than indoor growth.

Mold Conclusions and Recommendations

- Overall, mold spores in B1 Theatre were at Low-Medium level per the European Union mold exposure standards. Indoor spores are likely due to outdoor entrainment as both indoor and outdoor mold spores have the same species.
- Indoor relative humidity levels were on average at 70% throughout the tested area, which exceeds the ASHRAE guideline (30-55%). In particular, average relative humidity in B1 floor were greater than 70%. Damp conditions encourage growth of mold, bacteria and insects, which can be potentially allergenic and can either trigger asthma or lead to the development of allergies. We recommend:
    - Use hygrometers to monitor indoor relative humidity levels.
    - Consider to use dehumidifiers or A/C dehumidification function when levels consistently exceed 55%.

- ***Basidiospores* spores are the dominant type in both samples**.
  - *Basidiospores* are found naturally in gardens and greenery. Spores are released in large quantities during periods of high humidity and rain.
  - *Basidiospore* spores should not pose a significant human threat to human health, but are found to allergenic, particularly to individuals with respiratory sensitivities.
  - Mushrooms are a common type of *Basidiospores*.

- ***Cladosporium* spores are identified in both samples.**
  - This genus of mold is one of the most ubiquitous types of mold found both indoors and outdoors. They are dark-green black in appearance and grow on wet surfaces.
  - While *Cladosporium* molds are seldom pathogenic to humans, spores can cause or lead to the development of asthma or allergies. There have been instances where individuals developed infections (respiratory, skin, etc.) from direct exposure to these types of molds.



Guide to Interpreting Your Scores

Category	Observations / measurements
Spore count	Spores per cubic meter. This measurement should be compared to outdoor level. The indoor level is typically 20-40% of outdoor levels and higher levels than outdoors usually indicate active indoor growth. Although there are no specific standards for indoor spore count, there are two relevant guidelines. 1. IAQA Training guidance (Baxter Etals): Mold contamination is considered present in a building when the total spore concentration is **above 10,000 / m3.** 2. European Union mold exposure standards: for apartments the E.U. uses these mold level designations a. Indoor mold spore counts of **< 50/m³ very low** b. Indoor mold spore counts of **< 200/m³ low** c. Indoor mold spore counts of **< 1000/m³ medium** d. Indoor mold spore counts of **< 10000/m³ high** e. Indoor mold spore counts of **> 10000/m³ very high**

Dust Mite Testing Results & Analysis

INDOOR biotechnologies INC

700 Harris Street
Charlottesville VA, 22903
(434) 984-2304
www.inbio.com

Indoor Allergen Analysis Report
Allergen Analysis Results
InBio™ Services

Batch ID: 18-0501M

E=ELISA, M=MARIA, T=Endotoxin, Z=Enzyme

PureLiving
Kimi Shi/Peijia Yan
Jiachun 753, Building C, 3rd FL, 753 Yuyuan Rd, Changning Dist.
Shanghai, China 200050
PHONE: +86-185-6905-6735

Project ID#

Date Received: 12/4/2018
Date Assayed: 12/5/2018
Date Reported: 12/5/2018 4:52:27 PM

Der p 1 and Der f 1 results reported as microgram allergen per gram dust.

		Mite Allergens:		*Cat:*	*Dog:*	*Cockroach:*
Accession:	*Sample:*	Der p 1	Der f 1	Fel d 1	Can f 1	Bla g 2
218-2938	1	0.054	0.064			
218-2939	2	0.059	0.347			

NES = Insufficient sample for the assay
The reporting limit is 0.012 ug/g for Der p 1 and Der f 1.

Der p 1 and Der f 1 results reported as microgram allergen per gram dust.

		Mite Allergens:		*Cat:*	*Dog:*	*Cockroach:*
Accession:	***Sample:***	**Der p 1**	**Der f 1**	**Fel d 1**	**Can f 1**	**Bla g 2**

Guidelines: The following guidelines for Dermatophagoides mite, cat, dog and cockroach allergen levels in house dust have been proposed: 1,2,3,6

		MITE Group 1	CAT/DOG	Bla g 1	Bla g 2
LOW	(not sufficient to cause allergic symptoms)	< 2 µg Mite Group 1/g dust	< 0.2 µg Fel d 1 or Can f 1/g dust	< 0.10 µg Bla g 1/g dust	< 0.20 µg Bla g 2/g dust
SIGNIFICANT	(risk for sensitization and bronchial hyperactivity)	2-10 µg Mite Group 1/g dust	8-20 µg Fel d 1 or Can f 1/g dust	0.10-0.80 µg Bla g 1/g dust	0.20-0.4 µg Bla g 2/g dust
HIGH	(risk for acute asthmatic attack)	> 10 µg Mite Group 1/g dust	1-8 µg Fel d 1 or Can f 1/g dust	>0.80 µg Bla g 1/g dust	> 1 µg Bla g 2/g dust

CAT/DOG The results of two studies have observed that increased exposure to high levels of Fel d 1 and Can f 1 have caused individuals to develop a tolerance, which means that individuals could potentially be exposed to 8-20ug/g dust and only experience mild allergic symptoms. Individuals with less exposure to high levels of Fel d 1 and Can f 1 (1-8ug/g dust) may experience more severe allergic symptoms. 2,4,6

COCKROACH Allergen exposure threshold levels for sensitization have been published in Units/g dust. Some investigators feel that any detectable level of cockroach allergen is clinically significant because its presence identifies a building in which persons who are cockroach allergic are at risk to develop symptoms because of exposure. 5,6

1. J. Allergy Clin Immunol 1989; 83:416-427.
2. Amer Rev Respir Dis 1990; 141:361-367
3. Amer Rev Respir Dis 1993; 147:573-578
4. Amer J Res Crit Care Med 1997; 155:94-98
5. J. Allergy Clin Immunol 1997; 100:S1-S24
6. Pediatric Allergy Principles and Practice 2003; 261-68

* This report furnishes information only and is not intended to be an interpretation of the results. Whether an individual suffers allergic symptoms or not depends not only on the level of allergens in his/her environment but also on his/her medical history and previous exposure.

Report reviewed and approved by:
Stephanie Filep, BS
Director of Laboratory Services

NES = Insufficient sample for the assay
The reporting limit is 0.012 ug/g for Der p 1 and Der f 1.

Dust Mite Testing Plan

1. 1F Classroom L118 - beddings

2. 2F Classroom L210 – cushions/rugs

Dust Mite Results and Analysis

Mite Allergens	Der p 1	Der f 1
1F Classroom L118	Low (0.054 ug Mite Group/g dust)	Low (0.064 ug Mite Group/g dust)
2F Classroom L210	Low (0.059 ug Mite Group/g dust)	Low (0.347 ug Mite Group/g dust)
Guideline	0.2 ug/g	0.2 ug/g

- Levels of the two dominant allergens, Der p 1[1] & Der f 1[2], were detected to be low possibility to cause allergic symptoms.

[1] Der p 1 (*Dermatophagoides pteronyssinus*; common name: European house dust mite)
[2] Der f 1 (*Dermatophagoides farina*; common name: American house dust mite)

Dust Mite – Specific Areas of Concern

- The health effects of exposure to dust mites are mainly due to allergic reaction caused by the potent digestive enzymes contained in the mite's gut. Common symptoms are wheezing, allergic rhinitis and asthma.
- Out of control dust mite infestation in the home may lead to atopic dermatitis and epidermal barrier damage.
- Those with compromised immune systems may suffer more severe effects from dust mite infestation and immunotherapy can be used in those affected.
- Methods such as air purifiers, air cleaners, air ionizers or air duct cleaning have not been found to be effective to control mites. Chemical sprays are not useful when treat furnishings because they do not penetrate into those furnishings and reach as deep as the mites burrow.

Dust Mite – Courses of Action

- If curtains are the heavy type, replace them with blinds or light cotton drapes.
- Replace soft furniture with wooden, plastic or vinyl furniture. If possible, remove carpets from classrooms.
- Apply a disposable face mask while doing vacuum cleaning. A cleaner with 2-layer microfiltration bags are preferred to prevent allergens being transferred from the vacuum cleaner into the air.
- Either freezing or dry heat can kill mites. For instance, put soft toys overnight in the freezer is effective but must wash them afterwards to further remove allergen. Leaving carpets out during a dry hot day can also help kill mites. Another approach to control mites in carpets is by applying acaricide (containing 3-5% benzyl benzoate) to carpets on a monthly manner to be effective.

Test Report

Report No. A2180238429101

Applicant SHANGHAI HONG QIAO INTERNATIONAL SCHOOL
Address 218 SOUTH YI LI ROAD, CHANGNING DISTRICT, SHANGHAI, CHINA

The following sample(s) and sample information was/were submitted and identified by/on the behalf of the client

No.	Sample Name(s)
001	B109 Art Room
002	L118 Classroom
003	L210 Classroom

Sample Received Date Dec. 4, 2018
Testing Period Dec. 4, 2018 to Dec. 6, 2018

Test Requested As specified by client, to test Lead(Pb) in the submitted sample(s).

Test Method/Test Result(s) Please refer to the following page(s).

Tested by Xiang Qing Jiang Reviewed by Sha Chen

Approved by Lin Zhang Date Dec. 6, 2018

Lin Zhang
Technical Manager

No. R311141796

Centre Testing International (Ningbo) Co.,Ltd. 1-2F, Eastern Factory, No.76, Jinghua Road, High-Tech Zone, Ningbo, Zhejiang, China

Test Report

Report No. A2180238429101

Test Method

Tested Item(s)	Test Method	Measured Equipment(s)
Lead(Pb)	Refer to EPA 3052:1996 & EPA 6010D:2014	ICP-OES

Test Result(s)

Tested Item(s)	**Result**			**MDL**
	001	**002**	**003**	
Lead (Pb)	N.D.	N.D.	N.D.	2 mg/kg

Tested Sample/Part Description

001 White solid

002 White solid(Tested as a whole) ▽

003 White solid(Tested as a whole) ▽

Remark: **The sample(s) had been dissolved totally tested for Lead.**

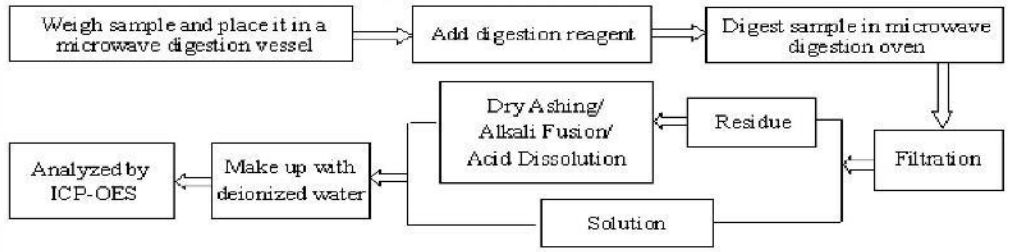
▽=The sample(s) was tested as a whole, because it's impossible to disassemble or separate it by current equipment and technology.The result(s) shown on this report may be different from the content of any homogeneous material.

-MDL = Method Detection Limit

-N.D. = Not Detected (<MDL)

-mg/kg = ppm = parts per million

Test Process



Material Lead Testing Plan

Laboratory Test Method:
EPA Method 6010D – 2014 (ICP—OES: Inductively Coupled Plasma—Optical Emission Spectrometry)

Reference Standards:
Federal requirements limiting lead in paint and similar surface coatings per the Consumer Product Safety Commission (CPSC), which can be found in section 101 of the Consumer Product Safety Improvement Act of 2008 (CPSIA) (Public Law 110-314), as modified by H.R. 2715 (Public Law 112-28, August 12, 2011) and in 16 CFR part 1303.

Material Lead Results and Analysis

Testing Points	Item	Lead Content (PPM)	Standards (PPM)
1	Lead in Paint – B109 Art Room	ND	**90 (CPSC)**
2	Lead in Paint – L118 Classroom	ND	**90 (CPSC)**
3	Lead in Paint – L210 Classroom	ND	**90 (CPSC)**

***"ND" is short for "None detected", which means the pollutant concentration in the substrate is lower than the test limit of analytical instruments.

Material Lead Conclusions and Recommendations

1. **Lead was not detected in all tested sample**.
2. Although lead level in wall paints were under detection limit, deciduous wall paint on site may cause particles release and increase indoor particulate levels
3. We recommend:
   a) Repair the walls in classrooms
   b) Run HEPA-equipped filter to capture particles

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About Us

PureLiving (www.purelivingchina.com) is China's leading indoor environmental health and safety consulting firm focused on advising clients on air and water quality, mold, asbestos, and lead exposure issues. In addition to independent, government-certified testing, we also interpret results based on rigorous international standards and provide independent recommendations and solutions tailored to our clients' budgets and needs. We understand that in a market where standards may be low and test results can be purchased, credibility and trust is everything. With offices in Beijing, Chengdu, Shanghai, Suzhou, and Hong Kong, we have completed over 6,000 residential and commercial projects throughout China and the quality of our reports and high level of professional service has been lauded by clients and reviewers in The Wall Street Journal, CNN, and The Guardian. In addition to our residential business, we have assisted corporate customers from small startups through Fortune 500 multinational companies.

Appendix A: Investigation Images

Figure 1-2. Similar TVOC readings were found next to renovated area and patio

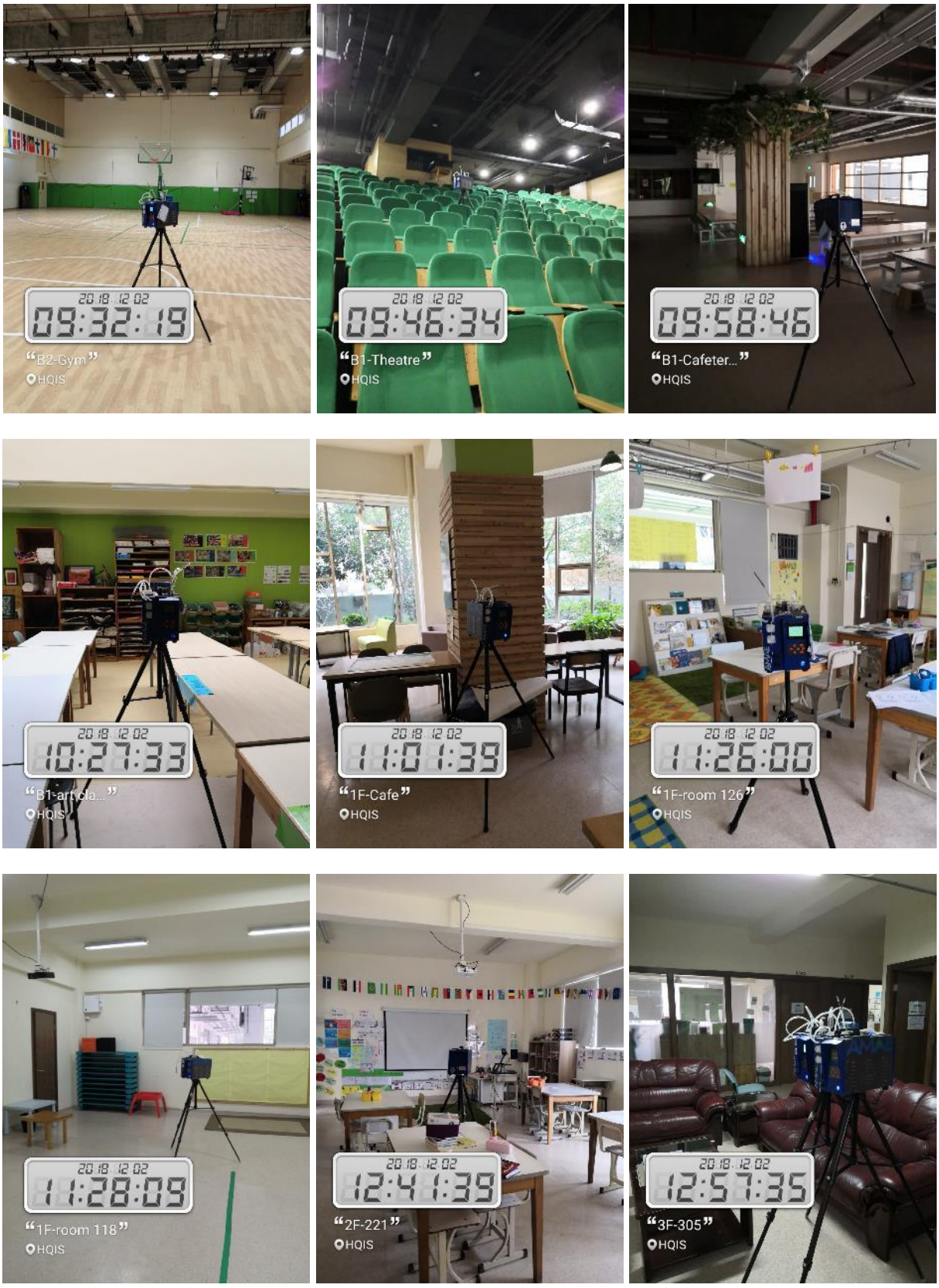


Figure 3-11. Air sampling of TVOC, formaldehyde, and benzene per GB/T 18883-2002

Figure 12-13. Measurement of CO2, relative humidity, and temperature

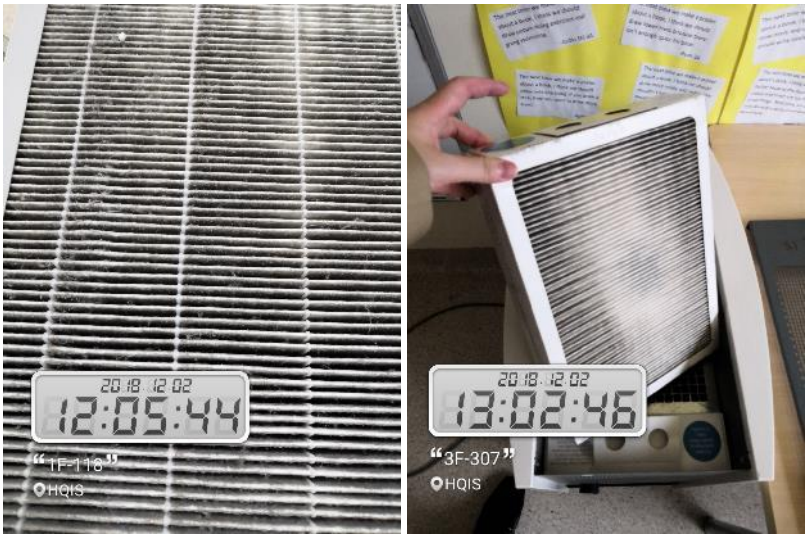


Figure 14-15. Filter media should be replaced regularly per manufaturer's direction

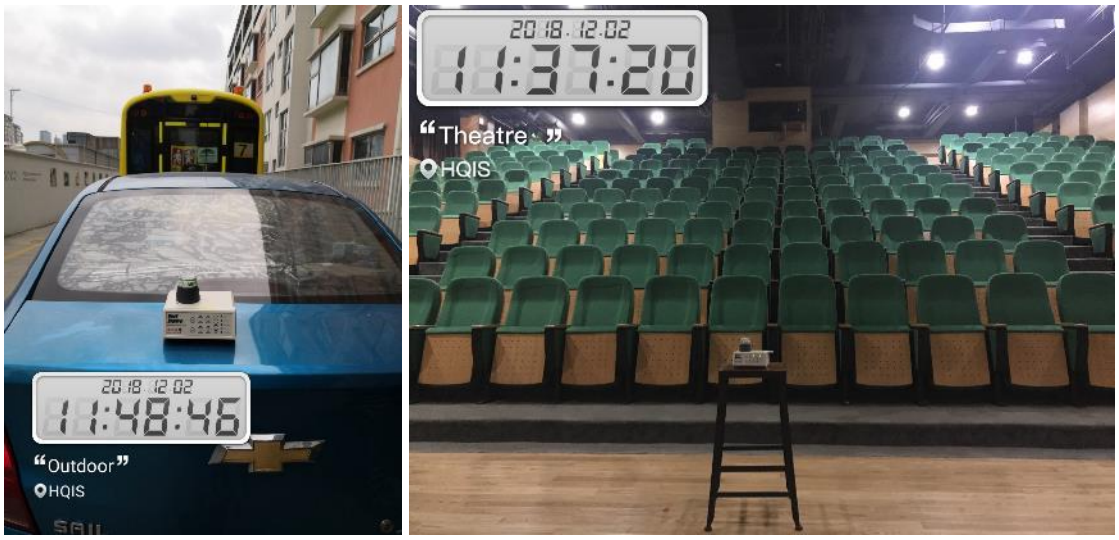


Figure 16-17. Air sampling of mold spores

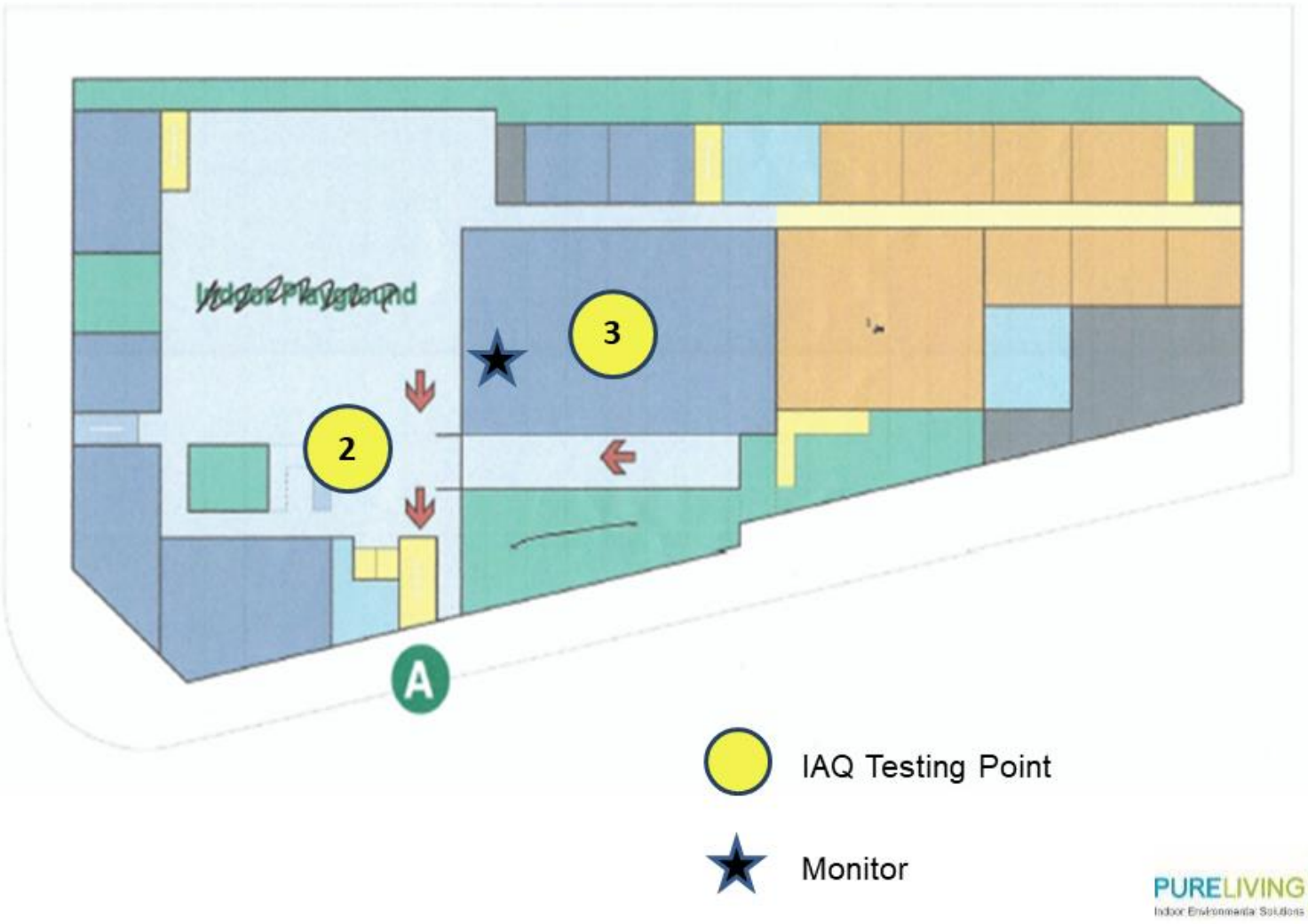
Figure 18-19. Dust Mite Sampling

Figure 20. Material Lead Sampling

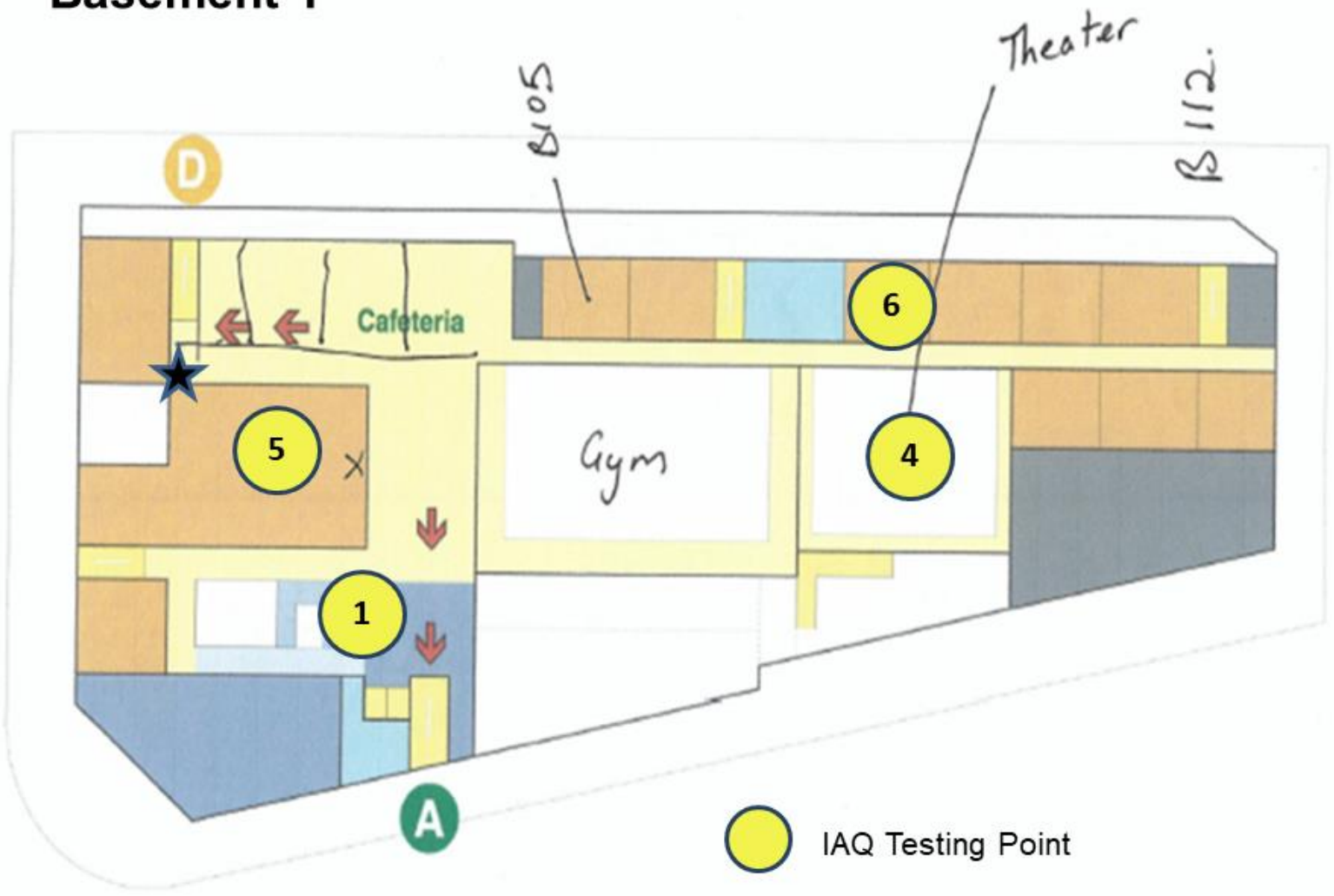
Figure 21-22. Deciduous wall paint on site may cause particles release and increase indoor PM levels

Appendix B: Floor plan with Testing Points

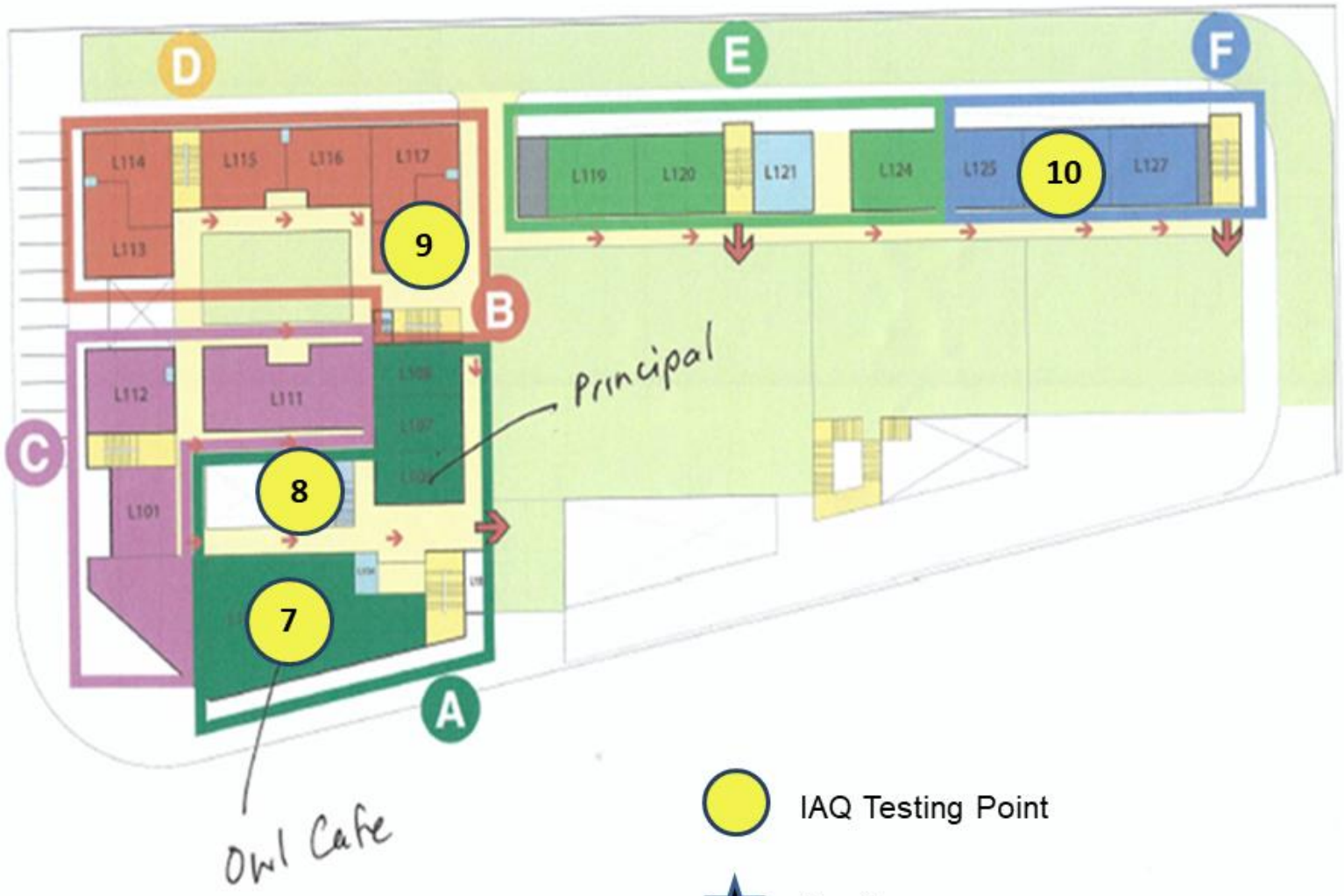
Basement 2



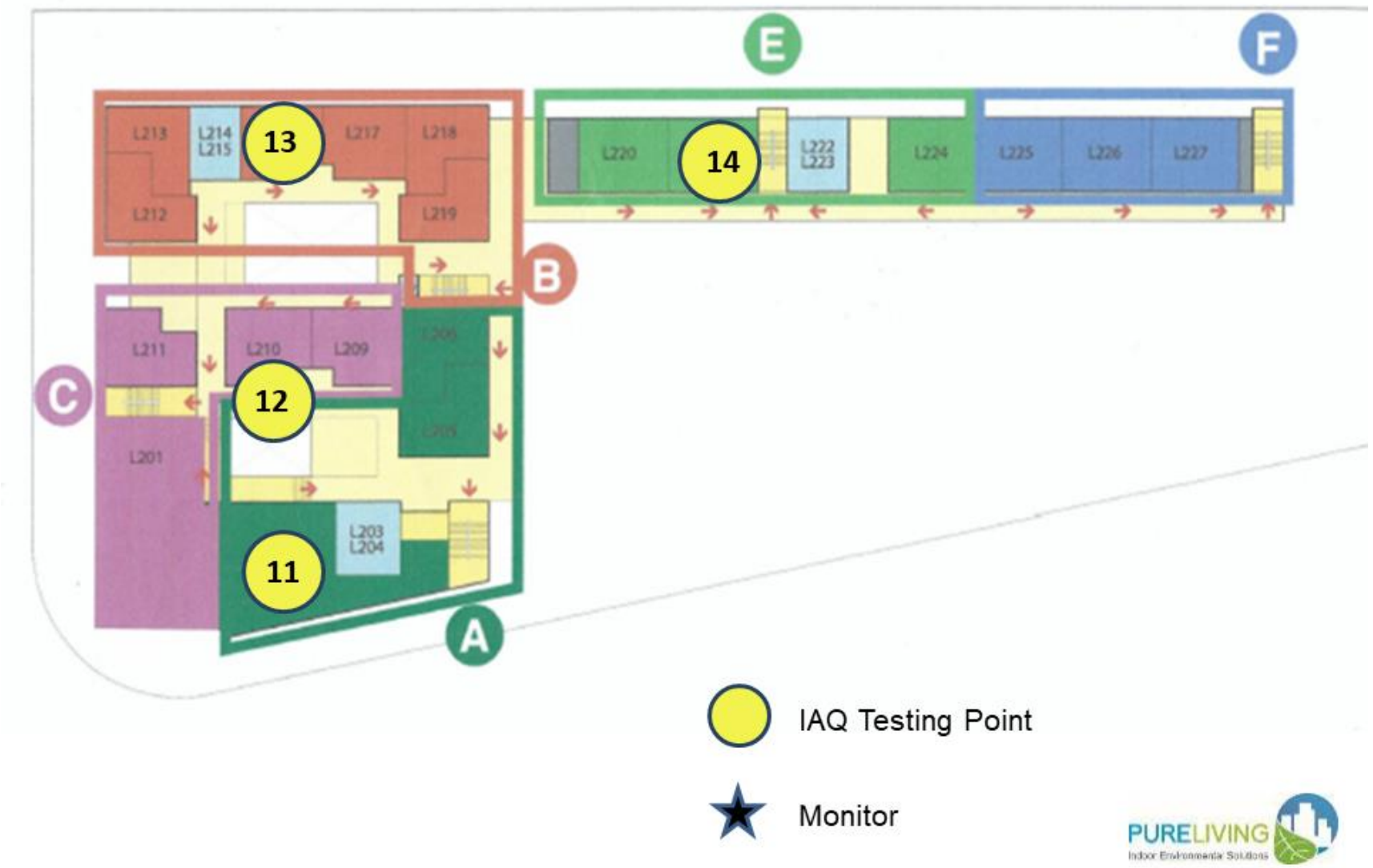
Basement 1



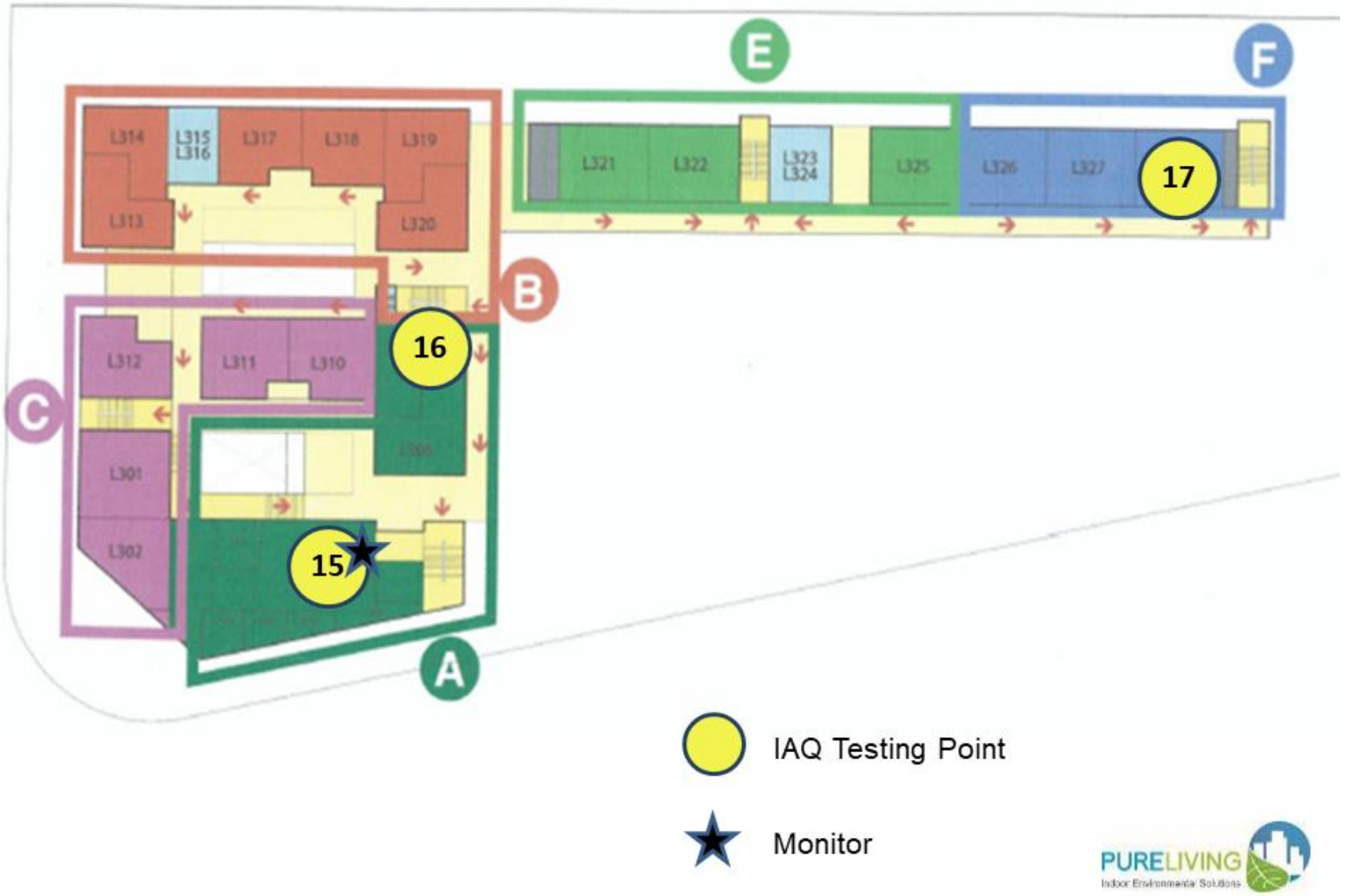
Level 1



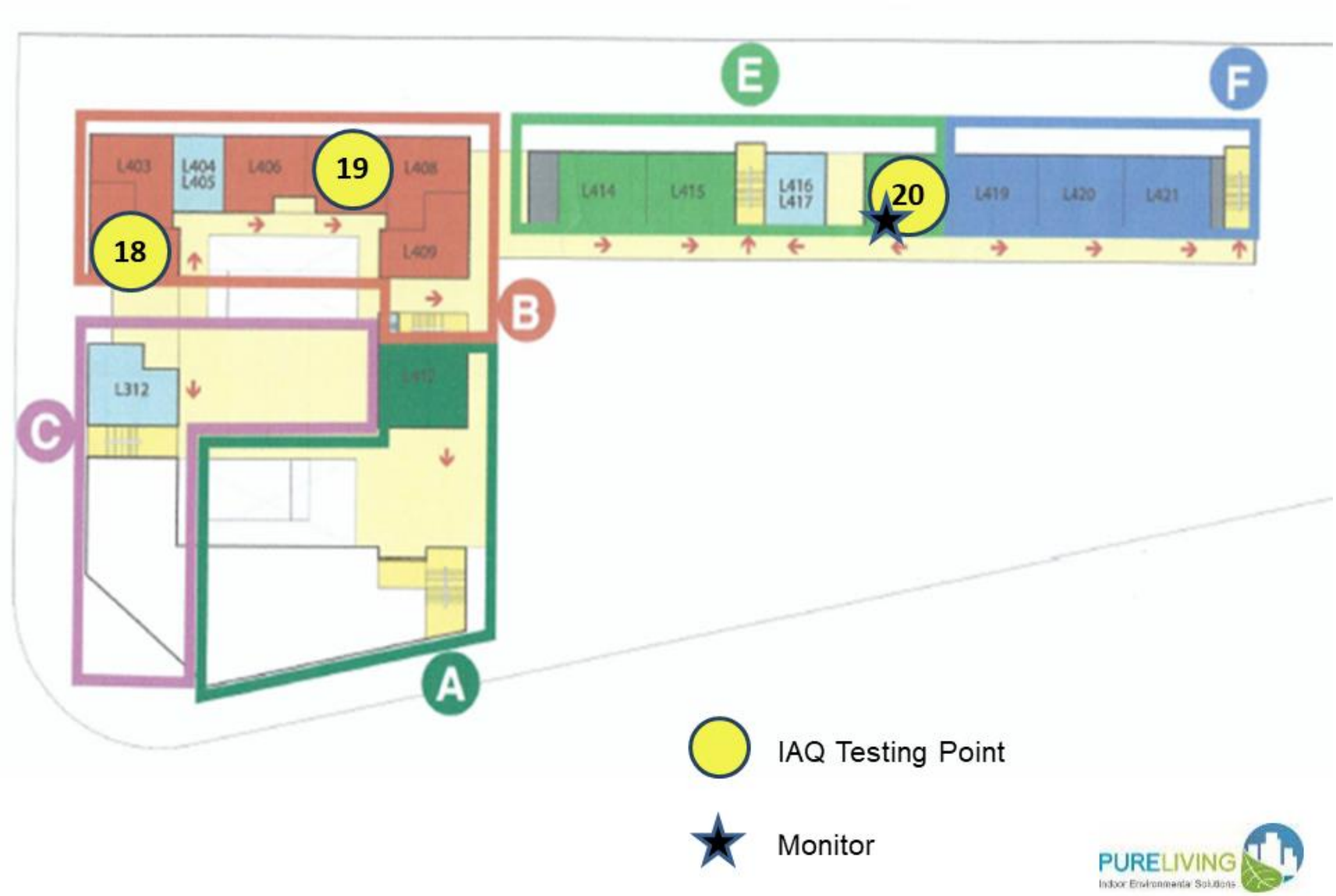
Level 2



Level 3



Level 4



Appendix C: Mold Introduction

Mold is the common word for any fungus that grows on food or damp building materials. It often looks like a stain and comes in a variety of colors. In nature, mold helps decompose or break-down leaves, wood and other plant debris. Molds become a problem when they grow where they are not wanted and digest materials such as our homes. In some cases, however, mold may not be visible but may have a musty odor. If allowed to grow, mold can contribute to poor indoor air quality and impact health.

Mold requires four things to grow:

- Acceptable temperature range
- Oxygen
- Food material (nearly any substance – leather, fabric, paint, cellulose, even skin oils)
- Moisture

Of these, the only one that we can control is the last one: moisture. Washing, cooking, air humidifiers, unvented clothes dryers, condensation and leaks from the outside all produce the kind of indoor moisture that mold needs to grow. Also, poor ventilation contributes to higher humidity levels and leads to condensation, which also allows mold to grow.

Why is this a problem in China?

Despite common belief, mold does in fact grow in China! As long as oxygen, moisture, and a food source are available, mold can take root. Many foreigners are accustomed to looking for mold in walls, under carpets, and in basements. However, these are not the usual suspects in China, where the construction material of choice is cement, bare floors are common, and few people deal with a basement. Yet, the prevalence of humidifiers, abundance of rain in the spring and summer, the tightly sealed construction of new apartments, lack of insulation, and poor ventilation mean that mold still is very much a problem. The largest part of the problem is that the low attention to mold issues and incorrect remediation results in a higher degree of unwitting exposure.

What is the health impact?

In order to reproduce or when disturbed, molds release small "spores" into the air and these spores are small enough that people can actually breathe them in. These spores in turn may release microbial volatile organic compounds (MVOCs). The musty, earthy odors that you smell when you enter an area with mold are created by these MVOCs. Similar to VOCs released by manmade items and petrochemicals, MVOCs can cause adverse reactions in people. Our reaction to the spores and MVOCs is what causes illness. Mold has a probable link to a wide variety of symptoms, depending on species type and each individual's personal reaction. Common symptoms may include:

- Eye, nose and throat irritation
- Headaches
- Coughing and phlegm build-up
- Wheezing and shortness of breath
- Allergic reactions and triggering of asthma attacks

Although healthy adults may not react to mold, WHO research has found that damp and mold increases the risk of respiratory disease in children and adults by 50%[3]. Further, mold combined with dust mites may account for 20% of asthma prevalence[4]. At special risk are those who already have allergy sensitivities or asthma, lung disease, and also those with weakened immune systems such as the elderly, or with leukemia or AIDS.

A small number of molds produce toxins called mycotoxins. When people are exposed to mold mycotoxins they may suffer toxic effects, including fatigue, nosebleeds, nausea, headaches, and irritation to the lungs and eyes. Infants have developed bleeding in their lungs. In rare cases, most famously with what is popularly called, "toxic black mold," mycotoxins can lead to fatalities.

In addition to the health impact, mold causes physical damage, spreads quickly, and can be very costly for homeowners if not quickly and effectively resolved.

—End of Report—

[3] WHO statistics: http://www.euro.who.int/en/what-we-do/health-topics/environmental-health/air-quality/facts-and-figures

[4] WHO report citing Melse and de Hollander, 2001.