



**GEOTEK ENGINEERING
& TESTING SERVICES, INC.**
909 East 50th Street North
Sioux Falls, South Dakota 57104
605-335-5512 Fax 605-335-0773

March 30, 2026

Brookings School District 05-1
2130 8th St. S.
Brookings, SD 57006

Subj: IAQ/Limited Mold Testing Report
Brookings Highschool
530 Elm Ave.
Brookings, SD
GeoTek #26-0249

Mr. Brian Corlett;

GeoTek performed an indoor air quality (IAQ) site assessment for mold at the referenced location on March 30, 2026. Testing was requested as a screen of air quality in the high school building.

Thank you for contacting GeoTek regarding indoor air quality testing on this project, we appreciate your business. If you have any questions or if we may be of further assistance, please give us a call at 605/335-5512.

GEOTEK ENGINEERING & TESTING SERVICES, INC.

Johnathan Arbach
Project Manager

**INDOOR AIR QUALITY
LIMITED MOLD TESTING**

Site:

**Brookings Highschool
530 Elm Ave.
Brookings, SD**

GeoTek #26-0249

Prepared by:

**Johnathan Arbach – Project Manager/Staff Scientist
GeoTek Engineering & Testing Services, Inc.
909 East 50th Street North
Sioux Falls, SD 57104**

Tested: March 30, 2026

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EXECUTIVE SUMMARY

GeoTek performed an indoor air quality (IAQ) site assessment and limited testing for mold at the referenced project site on March 30, 2026. Testing was requested as a screen of air quality in the high school building.

Airborne sampling results indicated low to normal mold levels in the areas tested. Visible mold was not observed.

Indoor air quality parameters measured during our site visit (CO₂, RH, CO, Temp.) did not indicate levels outside of ASHRAE (American Society of Heating, Refrigerating & Air Conditioning Engineers) guidelines in the areas tested.

1.0 INTRODUCTION

1.1 Purpose of Work

The purpose of this work was to complete an indoor air quality (IAQ) site assessment and limited mold testing at the referenced project site. Testing was requested as a screen of air quality in the high school building.

2.0 BACKGROUND INFORMATION

2.1 Site Description/History

The structure is a large, one-story, brick school building. It is our understanding that it was decided to perform regular screening of mold levels since there had been some complaints of odors and air quality in the past.

3.0 ASSESSMENT RESULTS

3.1 Observations

A GeoTek Staff Scientists, Katherine Howard and Johnathan Arbach, arrived on site Monday, March 30, 2026 at approximately 9:00 am. Airborne mold samples were collected in halls throughout the facility and in the library. An exterior air sample was collected for comparison.

3.2 QTRAK Instrument Readings

It is standard procedure for GeoTek to include QTRAK readings for IAQ assessments. The QTRAK meter (TSI, Inc.) records air measurements including carbon dioxide (CO₂), carbon monoxide (CO), relative humidity (%RH) and temperature (°F).

Locations	CO ₂ (ppm)	Temperature (°F)	Relative Humidity (%)	CO (ppm)
200 Hallway – Science Area	600	69.5°	28.0	0.0
Room 220 - Library	660	69.7°	30.0	0.0
100 Hallway – by 125	685	70.5°	28.0	0.0
500 Hallway – by 503	774	69.8°	28.0	0.0
Locker Room Hall – E End	788	70.9°	32.0	0.0
Ag Lab Hallway – W End	829	71.6°	31.6	0.0
Outside – South of Building	434	59.6°	44.6	0.0
Guidelines	<1000	68-76 F *	30-50% 20-30%**	<9

* = ASHRAE guideline based on body odors and comfort in offices.

** = To minimize moisture, keep %RH between 20-30% in winter and below 50% in summer.

*** = Spaces not meant for human occupation cannot be evaluated by these standards.

Carbon dioxide (CO₂) is produced as people breathe in oxygen and exhale CO₂. It is often used as a crude indicator of ventilation. Normal well-ventilated rooms usually have about 700-900 ppm CO₂ with people present while poorly ventilated rooms may exceed 1000-1500 ppm CO₂. Outside air is usually about 350-450 ppm. The American Society of Heating, Refrigeration, and Air conditioning Engineers (1997) recommends a maximum of 1000 ppm CO₂. Complaints may increase when concentrations exceed 1000-2000 ppm CO₂. High CO₂ levels sometimes suggest insufficient ventilation (lack of fresh, outside air). This may contribute to headaches, fatigue, and reduced productivity. However, severe health effects are not related to carbon dioxide below 5000 ppm (OSHA limit). **Carbon dioxide readings were within the recommended guidelines in the areas tested.**

Carbon monoxide (CO) is a gas given off due to incomplete combustion. Sources include furnaces, vehicles, kerosene, gas water heaters, etc. The current OSHA permissible exposure limit (PEL) is 50 ppm as an 8-hour exposure for industrial workers. Average levels in homes without gas stoves vary from 0.5 to 5 ppm. CO limits the absorption of oxygen into the bloodstream and can cause headaches and other symptoms. **Direct readings did not indicate the presence of CO at levels of concern in the areas tested.**

Temperature (°F) measures air temperature. For office workers, ASHRAE (1992) suggests 68-75 °F in winter and 73-76 °F in summer. **Temperature is often based on occupant comfort.**

Relative humidity (%RH) is a measure of moisture in the air. Moisture levels in excess of 60-70% feel uncomfortable and may promote mold growth. To reduce microbiological growth, relative humidity should be kept below 50% during warm months and below 30% in colder months. Relative humidity usually should not be reduced below 20% in the winter. Health complaints occur much more frequently when below 30% RH and especially below 20% RH (Godish, 1995, p.56; ASHRAE, 1997, p.8.12). This can include static electricity problems to equipment, and eye and respiratory system irritations (ASHRAE, 2000, p. S20-2). **Relative humidity readings were within the recommended guidelines in the areas tested.**

4.0 MOLD TEST RESULTS

Mold testing methods include: (1) visible mold, and (2) airborne mold. Both methods are useful and provide supporting information. Sampling results are attached in Appendix A with major genera summarized in Table 1. See Appendices B, C, D & E for mold testing options and methods, mold exposure guidelines, and general suggestions for reducing mold concerns.

4.1. Visible Mold

Visible mold was not observed. Below is some general information about visible mold.

Some molds such as *Alternaria* and *Cladosporium* are often considered nonproblem indicating molds that can live in moist conditions and do not always indicate a concern. *Aspergillus*, *Penicillium* and *Scopulariopsis* can survive in dry to moist conditions and are very common, however, their presence at elevated airborne levels is often considered a problem indicator. They are allergen molds and are sometimes of concern. The presence of some molds such as *Bispora*, *Phialophora*, and *Taeniolella* are indicative of wood rot. Slight amounts of visible mold do not necessarily indicate a problem exists. However, large amounts of any visible mold may be cause for concern.

Common mycotoxin producing fungi that are present in water-damaged buildings and building systems include species of *Alternaria*, *Aspergillus*, *Chaetomium*, *Memnoniella*, *Paecilomyces*, *Penicillium*, *Phoma*, *Stachybotrys*, and *Trichoderma*. Environmental conditions, such as temperature, humidity, climate, and growing substrate significantly influence whether mycotoxins are produced or not. Slight amounts of some of these molds are not uncommon (EML Laboratories, Shelton, et.al., 2002). Many visible molds are not a concern unless disturbed. Cleaning, remodeling, demolition, etc., may stir up visible molds and produce high airborne levels.

4.2 Airborne Testing

A total of 7 airborne samples for nonviable (not cultured) mold were collected. Non-viable mold includes both living and dead mold collected in a cassette and identified under a microscope (not cultured). Data is reported in spores per cubic meter of air (spores/m³). Tests were taken using

Allergenco cassettes at a calibrated flow rate of 15 liters/minute for 5 minutes each.

4.2.1 Non-Viable Mold – General

Non-viable mold data for major molds are shown in Table I. (See also lab analyses in Appendix A.) Non-viable mold includes both living and dead mold collected in a cassette and identified under a microscope (not cultured). Non-viable tests provide less accurate identification of specific molds but often provide a good indication of total mold. Both living and dead molds can be allergens and produce mycotoxins.

Normal non-viable mold levels for non-problem buildings are typically in the range of 500 to 3000 spores/m³. Higher levels may sometimes occur. This does not always indicate a problem exists, especially if airborne levels are higher outside. In non-problem buildings, mold levels are typically higher outside than inside (not always true in the winter months when temperature, weather, and ground cover can be a factor).

Indoor spore levels usually average 30-80% of the outdoor spore level at the time of sampling, with the same general distribution of spore types. Filtered air, air-conditioned air or air remote from outside sources may average 5-15% of the outside air at the time of sampling. (These percentages are guidelines only. A major factor is the accessibility of outdoor air. A residence with open doors and windows and heavy foot traffic may average 95% of the outdoor level while high rise office buildings with little air exchange may average 2%. Dusty interiors may exceed 100% of the outdoors to some degree, but will still mirror the outdoor distribution of spore types).

In warmer months, the moist mold *Cladosporium* (often considered a non-problem mold at low levels) is usually the most common mold both inside and outside in non-problem buildings. During winter months, the common molds, *Aspergillus* and *Penicillium*, may show increases. These molds tolerate drier conditions and may become more common in the winter months inside. They are considered problem indicators at higher levels (>1000-2000 spores/m³) or where they are the dominant mold present. The tiny spores for these two molds look alike in non-viable tests and are typically reported together as *Pen/Asp* or *Asp/Pen*.

Some molds that grow in very moist to wet conditions are considered problem indicators even at low levels. This may include *Stachybotrys*, *Trichoderma*, *Memmoniella*, *Chaetomium* and others. These molds produce mycotoxins and may be harmful to sensitive individuals. They are often poorly detected in airborne samples unless active disturbance (remodeling, etc.) is occurring.

4.2.2 Non-Viable Mold – Test Results

A substantial increase of one or two spore types which are inconsistent with and non-reflective of the outside distribution of spore types is usually indicative of an indoor reservoir of mold growth. In Table 1 the key genera are used to evaluate mold levels.

TABLE 1 - Summary of Major Genera Non-Viable Airborne Mold Tests

Sampling Location	Date	Total Mold (T=100%)	Cladosporium (%T) Common Dominant Mold	Penicillium/Aspergillus (%T) Moisture Indicator Mold	Chaetomium & Stachybotrys (%T) Wet Molds
200 Hallway – Science Area	03/30/2026	159	53 (33%)	53 (33%)	<i>Not Detected</i>
Room 220 - Library	03/30/2026	745	106 (14%)	533 (72%)	<i>Not Detected</i>
100 Hallway – by 125	03/30/2026	212	53 (25%)	53 (25%)	<i>Not Detected</i>
500 Hallway – by 503	03/30/2026	318	106 (33%)	106 (33%)	<i>Not Detected</i>
Locker Room Hall – E End	03/30/2026	798	213 (27%)	53 (7%)	<i>Not Detected</i>
Ag Lab Hallway – W End	03/30/2026	745	266 (36%)	213 (29%)	<i>Not Detected</i>
Informal Rule of Thumb Normal (Non-Problem) Mold Levels Inside Buildings					
Upper Range Most Buildings		<2000-4000	<2000-3000	<1000-2000	<50-250
Upper Range with good Filtration		<1000-3000	<1000-2000	<500-1000	Not Detected

Notes: Percent (%T) is percent mold type versus total mold. **Bold** = Possible Concern. Levels also depend on outside conditions. > - Indicates spores too numerous to count. Values given are estimates for quantitation purposes. The screening levels are based on GeoTek's experience and published literature of mold levels exceeding normal background levels. This is not a formal guideline. Most persons will not experience noticeable symptoms at these levels while sensitive persons may experience symptoms below these levels. Higher levels may be required to cause noticeable health symptoms, especially for only short-term exposure (hours).

* = Basements, attics, tunnels, crawlspaces, and wall cavity samples often have higher mold levels than ambient airborne samples.

** - Airborne sampling results showed spore types and levels consistent with outdoor air infiltration.

The **Outdoor – South** sample collected outside the building reported total mold levels at 2,238 spores/m³. The dominant mold was *Cladosporium* observed at 640 spores/m³ (29%). *Pen/Asp* was observed at 426 spores/m³ (<19%).

5.0 CONCLUSIONS/RECOMMENDATIONS

Airborne sampling results indicated low to normal mold levels in the areas tested. Visible mold was not observed.

Indoor air quality parameters measured during our site visit (CO₂, RH, CO, Temp.) did not indicate levels outside of ASHRAE guidelines in the areas tested. While the readings were currently within normal ranges, such low mold levels throughout the building may indicate that the offices were very dry during the winter. Dryness can also cause respiratory issues. It is recommended that relative humidity be monitored throughout the year and dehumidification be performed to keep the humidity below 50% in the warm months and 30% in the cool months. Humidification should be performed if the levels fall below 20%.

6.0 STANDARD OF CARE

The services performed by GeoTek Engineering & Testing Services, Inc., (GeoTek) on this project have been conducted with that level of care and skill ordinarily exercised by reputable members of the profession, practicing in the same locality under similar budget and time constraints. No other warranty is expressed or implied.

We emphasize mold testing methods have many limitations, especially short-term testing based on limited sampling (Burge, 1995, 2000). The presence or absence of indoor air quality mold related hazards applies only to tested or assessed areas on the date of the field visit and that conditions may change due to deterioration or maintenance. Ongoing monitoring by the owner or facility is usually necessary. This survey is not intended to represent exhaustive research of all potential hazards or conditions, which may exist. Mold present in concealed areas of the building not exposed to the general ventilation, such as wall cavities, may not be detected by airborne testing.

7.0 REMARKS

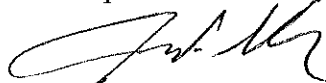
We appreciate the opportunity to be of service to you on this project. Please let us know if you have any questions or if we may be of further assistance.

GEOTEK ENGINEERING & TESTING SERVICES, INC.



Johnathan Arbach
Project Manager
Staff Scientist

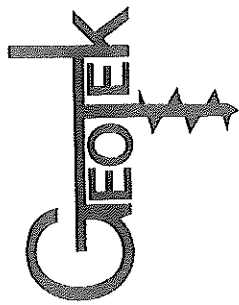
Report Reviewed by:



Jason Cook
Certified Industrial Hygienist
Senior Project Manager

GEOTEK APPENDIX A

LABORATORY ANALYSES



GEOTEK ENGINEERING
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909 EAST 50TH STREET NORTH
SIOUX FALLS, SD 57104
605-335-5512 FAX 605-335-0773

FOG	RAIN	SNOW	WIND	CLOUDY
NONE				
LIGHT				
MODERATE				
HEAVY				

NON-CULTURABLE	REQUESTED SERVICES (✓ BOXES)
SPORE TRAP	TAPE SWAB BULK
	MISC
	OTHER

CONTACT INFORMATION									
CLIENT:	Brookings School Dist. 05-1				CONTACT:	Brian Corlett			
ADDRESS:	2130 8th St. S				PHONE NO.:				
	Brookings, SD 57006				E-MAIL:	Brian, Corlett@K12.SD.US			
PROJECT INFORMATION									
PROJECT:	Brookings High School				TURN AROUND TIME CODES				
PROJECT ADDRESS:	S30 Elm Ave				STD - STANDARD (DEFAULT)				
PROJECT CITY, STATE:	Brookings, SD				SD - SAME BUSINESS DAY				
					ND - NEXT BUSINESS DAY				
					2D - TWO BUSINESS DAY				
SAMPLING DATE:	3-30-26								
PO NUMBER:	26-0249								
SAMPLE ID	CASSETTE ID	DESCRIPTION	SAMPLE TYPE (BELOW)	PUMP CAL (L/MIN)	SAMPLE TIME (MIN)	NOTES (TIME OF DAY, TEMP, RH, ETC.)	Fungi - Spore Trap Analysis	Fungi - Direct Microscopic Exam	Describe:
1	00176050	200 Hallway - Science Area		154	5m				
2	00176194	Room 220 - Library							
3	00176175	100 Hallway - by 125							
4	00176751	500 Hallway - by 503							
5	00176116	Locker Room Hallway - E End							
6	00175887	Ag Lab Hallway - W End							
7	00176728	Outside - South							
8									
9									
10									
SAMPLE TYPE CODES									
ST - SPORE TRAP: ZEFON ALLERGENCO, BURKARD...		T - TAPE	D - DUST		RELINQUISHED BY		DATE & TIME		RECEIVED BY
		SW - SWAB	W - WATER						3-30-26
SAS - SURFACE AIR SYS		B - BULK	SO - SOIL						
O - OTHER									

GeoTek Engineering Testing Services, Inc.
909 East 50th Street North, Sioux Falls, SD 57104
(605) 335-5512 Fax (605) 335-0773

Client: Brookings School Dist. 05-1 2130 8th St. S. Brookings, SD 57006	Site: Brookings High School 530 Elm Ave. Brookings, SD	Date of Sampling: 03/30/2026 Date of Received: 03/30/2026 Date of Analysis: 03/30/2026
		GeoTek#: 26-0249-4 Analyst: Katherine Howard
Analyst Signature: 		

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY ASTM D7391

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY ASTM D7391																
200 Hallway - Science Area			Room 220- Library			100 Hallway - by 125			500 Hallway - by 503							
#1 26-0249-#00176050			#2 26-0249-#00176194			#3 26-0249-#00176175			#4 26-0249-#00176751							
1000x - 25%			1000x - 25%			1000x - 25%			1000x - 25%							
Raw ct.	Spores/m ³	DL/ m ³	%	Raw ct.	Spores/m ³	DL/ m ³	%	Raw ct.	Spores/m ³	DL/ m ³	%	Raw ct.	Spores/m ³	DL/ m ³	%	
Alternaria																
Ascospores*																
Basidiospores*																
Cercospora/Pseudocercospora																
Cerebella/Monodictys/Acrodictys																
Chaetomium																
Cladosporium	1	53	53	33	2	106	53	14	1	53	53	25	2	106	53	33
Curvularia																
Drechslera/Bipolaris type																
Epicoccum					1	53	53	7								
Fusarium																
Nigrospora																
Oidium																
Penicillium/Aspergillus**	1	53	53	33	10	533	53	72	1	53	53	25	2	106	53	33
Pithomyces																
Rusts	1	53	53	33	1	53	53	7								
Smuts, Periconia, Myxomycetes																
Stachybotrys/Memnoniella																
Taeniolaella																
Ulocladium/Stemphylium																
Unknown, Other																
Pollen																
Background debris (1-4+)	2+				3+				1+				2+			
Sample volume (liters)	75				75				75				75			
TOTAL SPORES/M3		159	53	100		745	53	100		212	53	100		318	53	100

* Most of these spore types are not seen with culturable methods. Most of the ascofomes and basidiospores are "mushroom" spores while the rusts and smuts are plant pathogens.

**The spores of Aspergillus and Penicillium are small and round with very few distinguishing characteristics. They cannot be differentiated by non-viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.

**Background debris (graded from 1+ to 4+, indicating the largest amounts) is an indication of the amount of non-biological particulate matter present on the slide (dust in the air).

The Limit of Detection is the product of a raw count of 1 and 100 divided by the percent read. The analytical sensitivity (DL/ m³) is the product of the Limit of Detection and 1000 divided by the sample volume.

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Client: Brookings School Dist. 05-1
2130 8th St. S.
Brookings, SD 57006

Site: Brookings High School
530 Elm Ave.
Brookings, SD

Date of Sampling: 03/30/2026
Date of Received: 03/30/2026
Date of Analysis: 03/30/2026

GeoTek#: 26-0249-4
Analyst: Katherine Howard

Analyst Signature: 

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY ASTM D7391

Location:	Locker Room Hallway - E End				Ag Lab Hallway - W End				Outside - South			
Lab ID:	#5 26-0249-#00176116				#6 26-0249-#00175887				#7 26-0249-#00176728			
Standard Slide Identification	1000x - 25%				1000x - 25%				1000x - 25%			
	Raw ct.	Spores/m ³	DL/ m ³	%	Raw ct.	Spores/m ³	DL/ m ³	%	Raw ct.	Spores/m ³	DL/ m ³	%
Alternaria	3	160	53	20					3	160	53	7
Ascomycetes*	1	53	53	7					6	320	53	14
Basidiospores*					1	53	53	7	7	373	53	17
Cercospora/Pseudocercospora												
Cerebella/Monodictys/Acrodictys												
Chaetomium	4	213	53	27								
Cladosporium					5	266	53	36	12	640	53	29
Curvularia												
Drechslera/Bipolaris type												
Epicoecum	1	53	53	7					1	53	53	2
Fusarium												
Nigrospora												
Oidium												
Penicillium/Aspergillus**	1	53	53	7	4	213	53	29	8	426	53	19
Pithomyces												
Rusts					1	53	53	7				
Smuts, Periconia, Myxomycetes	4	213	53	27	3	160	53	21	5	266	53	12
Stachybotrys/Memnoniella												
Spegazzinia	1	53	53	7								
Ulocladium/Stremphyium												
Unknown, Other												
Pollen									Present			
Background debris (1-4+)	2+				2+				3+			
Sample volume (liters)	75				75				75			
TOTAL SPORES/M3		798	53	100		745	53	100		2,238	53	100

* Most of these spore types are not seen with culturable methods. Most of the ascomycetes and basidiospores are "mushroom" spores while the rusts and smuts are plant pathogens.

**The spores of Aspergillus and Penicillium are small and round with very few distinguishing characteristics. They cannot be differentiated by non-viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.

***Background debris (graded from 1+ to 4+, indicating the largest amounts) is an indication of the amount of non-biological particulate matter present on the slide (dust in the air).

The Limit of Detection is the product of a raw count of 1 and 100 divided by the percent read. The analytical sensitivity (DL/ m³) is the product of the Limit of Detection and 1000 divided by the sample volume.

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TABLE I - Sample Evaluation

Summary of Major Genera Non-Viable Airborne Mold Tests
Brookings High School
530 Elm Ave.
Brookings, SD

Units in Spores/m³

Sampling Location	Date	Total Mold (T=100%)	Cladosporium (%T) Common Dominant Mold	Penicillium Aspergillus (%T) Moisture Indicator Mold	Chaetomium & Stachybotrys (%T) Wet Molds
200 Hallway - Science Area	03/30/2026	159	53 33 %	53 33 %	Not Detected
Room 220- Libraray	03/30/2026	745	106 14 %	533 72 %	Not Detected
100 Hallway - by 125	03/30/2026	212	53 25 %	53 25 %	Not Detected
500 Hallway - by 503	03/30/2026	318	106 33 %	106 33 %	Not Detected
Locker Room Hallway - E End	03/30/2026	798	213 27 %	53 7 %	Not Detected
Ag Lab Hallway - W End	03/30/2026	745	266 36 %	213 29 %	Not Detected
Outside - South	03/30/2026	2,238	640 29 %	426 19 %	Not Detected
Upper Range Most Building		<2000 - 4000	<2000 - 3000	<1000 - 2000	<50 - 250
Upper Range with Good Filtration		<1000 - 3000	<1000 - 2000	<500 - 1000	Not Detected

Notes: Percent (%T) is percent mold type versus total mold. **Bold** = Possible Concern. Levels also depend on outside conditions. Cladosporium is typically dominant in non-problem buildings.

Aspergillus/Penicillium are often the dominant molds in problem buildings. *Chaetomium* or *Stachybotrys* are considered wet, problem mold indicators. The levels used above are a general screening indicator based on GeoTek's experience and published literature of mold levels exceeding normal background levels. This is not a formal guideline. Most persons will not experience noticeable symptoms at these levels while sensitive persons may experience symptoms below these levels. Higher levels may be required to cause noticeable health symptoms, especially for only short-term exposure.

* = Basements, tunnels, **crawlspace**s, and wall cavity samples often have higher mold levels than ambient airborne samples.

** = Spore types and levels are consistent with outdoor air infiltration.

NORMAL SPORE LEVELS: Indoor spore levels usually average 30-80% of the outdoor spore level at the time of sampling, with the same general distribution of spore types. Filtered air, air-conditioned air or air remote from outside sources may average 5-15% of the outside air at the time of sampling. (These percentages are guidelines only. A major factor is the accessibility of outdoor air. A residence with open doors and windows and heavy foot traffic may average 95% of the outdoor level while high rise office buildings with little air exchange may average 2%. Dusty interiors may exceed 100% of the outdoors to some degree, but will still mirror the outdoor distribution of spore types).

PROBLEM INTERIORS: A substantial increase of one or two spore types which are inconsistent with and non-reflective of the outside distribution of spore types is usually indicative of an indoor reservoir of mold growth.

GEOTEK APPENDIX B MOLD TESTING METHODS

This appendix addresses normal mold sampling methods used by GeoTek. Mold problems are not always obvious. The absence of visible mold does not mean a problem does not exist. Mold can grow out of sight behind walls and in ductwork. Airborne testing is often needed to identify if a problem exists. Airborne tests are also useful for before and after testing of clean-ups.

There are two common mold sample types, Tape/Bulk and Airborne.

Tape/Bulk Mold Tests

Samples of visible mold can be collected by lifting it from a surface with clear (not frosted) scotch tape. The exposed tape is then placed (sticky side down) onto a new glass microscope slide. The slide is labeled with location, date and other information. The tape sample is then observed with a microscope (400-1000x). Small bulk samples may also be collected in plastic bags for direct microscopic examination.

Airborne Mold Tests

There are two common types of airborne mold tests, Viable and Non-Viable mold.

Viable (culturable) methods collect air samples on culture plates. Samples are grown for 1-2 weeks on various types of growth media (petri plates). Samples are collected from individual growth colonies and placed under a microscope. This method provides more accurate identification of specific molds (growth structures). But, mold growth is dependent on the type of growth media and may molds do not grow on the media chosen. This method usually detects only a fraction of the total mold present and quickly becomes overloaded at higher levels. Note: home test kits based on settle (gravity) culture plates are not considered reliable. Both viable and non-viable tests are often preferred when legal concerns are involved.

Non-Viable tests collect both living and dead molds onto a sticky plate inside a plastic cartridge or cassette (Air-O-Cell). The sticky plate is observed with a microscope (400-1000x). This method allows for quicker analysis than viable tests (because there is no culture period) but is less effective at identifying specific mold species as only the spores (not growth structures) are usually detected. This method does not work as well in the cold (plate becomes less sticky). The non-viable method provides a good way to measure the total amount of airborne mold present. This method can detect some mold (such as *Stachybotrys*) better than the viable method and can detect much higher levels than the viable method. Non-viable tests are the predominate test method for airborne mold.

Standard non-viable airborne tests are collected as follows. An Air-O-Cell cassette is attached to a high volume air pump calibrated to a flow rate of 15 liters/minute. The typical sampling period is 5 minutes. For very moldy environments, this may be reduced to 1 or 2 minutes. The air sample is taken about 2-4 ft above the floor. Typically, a few samples are collected from the building interior and one outside air sample is collected. Emphasis is placed on problem areas, crawlspaces, and basements.

In-wall non-viable tests are collected as follows. Mold tests inside walls are typically taken by removing the faceplate off an electric outlet and placing a plastic cone over the outlet. Using an Air-O-Cell cassette and air pump, a sample is collected for 1 minute at a flow rate of 15 liters/minute. Another method used is to make a small (1/4 inch) hole in the wall and insert a plastic tube connected to an Air-O-Cell cassette and air pump. This is often done in the space behind the baseboard just above the sill plate.

GEOTEK APPENDIX C

MOLD EXPOSURE – RULES OF THUMB AND GUIDELINES

There are no well accepted numerical guidelines for mold exposure. Some individuals are much more sensitive than others. Exposure to high mold doses over a prolonged period may cause sensitization (allergic reactions) in some. There is disagreement among the scientific community over some symptoms but there is growing consensus that damp and moldy buildings are often associated with increased health problems. Molds can vary greatly in toxicity even in the same species. Those most vulnerable include infants and children <2 yrs old, elderly, persons with severe allergies or asthma and persons with weakened immune systems (due to sickness or medical treatments). **Airborne exposure** is the main concern from mold.

Visible Mold

Small amounts of visible mold (including problem molds) are not uncommon and do not necessarily indicate a problem exists. However, large amounts of visible mold are considered a potential health risk and unacceptable in occupied buildings (Samson, 1994). The New York City Health Dept (2000) considers <10 square ft to be a small amount. See US EPA and NYCHD web pages

Small amounts of the common, often non-problem molds, *Alternaria* and *Cladosporium* are usually not considered a major concern (although large amounts of any mold may be). Some visible molds are considered problem indicators. Mycotoxin producing molds include *Alternaria*, *Aspergillus*, *Chaetomium*, *Paecilomyces*, *Penicillium*, *Phoma*, *Stachybotrys*, *Memmoniella*, *Trichoderma* and others. Many factors affect the amount of mycotoxins that may be produced by these molds. That is, mycotoxin levels may vary from site to site.

Evaluating the Results of Tape or Bulk Samples (from Aerotech P&K, 2004 – see their web page)

1. Determine whether the fungi are colonizing, growing, and amplifying and identify the fungus.
2. The presence of a few loose spores are considered as background dust deposits.
3. The presence of growth structures suggests colonization and growth but not amplification if spores are not produced.
4. The presence of growth structures and spores suggests growth and amplification.
5. The presence of spores does not necessarily indicate amplification. An unusual number of spores of the same kind may suggest contamination from sources nearby.
6. The degree of growth is described as: (note: trace spores are common and may not indicate a concern)
 - A. **Massive:** fungal structures cover the entire sample in more than one layer.
 - B. **Numerous:** one layer of fungal structures covers the entire view area.
 - C. **Many:** fungal structures cover 25% to near 90% of the viewing area.
 - D. **A few:** fungal structures are consistently detectable and countable, and cover up to 25% of the view area.
 - E. **A trace:** fungal structures are detectable when carefully examined by one analyst, but may be missed by another.
 - F. **No obvious fungal growth.**

Airborne Mold

Airborne mold levels can vary greatly from place to place and seasonally. Mold levels are typically lower in offices than in houses and often highest in basements and crawlspaces. **Remodeling or cleaning water damaged or moldy rooms may disturb mold and temporarily cause high airborne levels.**

There are general guides but no national recognized acceptable numerical exposure guidelines for exposure. In GeoTek's experience, many non-problem mold levels often do not exceed 2000-4000 spores/m³. However, health symptoms and mold problems appear to occur more frequently when mold levels exceed 5,000-10,000 spores/m³.

Rules of Thumb – Airborne Tests - Non Problem Buildings: (1). Total mold levels <2000-5000 spores/m³; (2) Inside levels are lower than outside levels (not true in winter); (3) Approximately the same molds are inside as well as outside; (4) *Cladosporium* is often the most dominant mold.

Rules of Thumb – Airborne Tests - Problem Buildings: (1) Total mold levels >5000-10,000 spores/m³. May be higher inside than outside (not true in winter); (2) Types of mold are different inside than outside with *Aspergillus* and *Penicillium* often being dominant; (3) *Aspergillus* and/or *Penicillium* levels often >5,000-10,000 spores/m³; (4) Noticeable levels (especially >500-1000 spores/m³) of wet, (often toxic), molds including *Chaetomium*, *Fusarium*, *Stachybotrys*, *Memmoniella*, and *Trichoderma*.

Informal Rule of Thumb Normal (Non-Problem) Mold Levels Inside Buildings (spores/m ³)				
Type of Mold	Total Mold	Cladosporium	Asp-Pen	Stachybotrys
Upper Range Most Buildings	<2000-4000	<2000-3000	<1000-2000	<50-250
Upper Range with good Filtration	<1000-3000	<1000-2000	<500-1000	Not Detected

GEOTEK APPENDIX D

REDUCING MOLD CONCERNS - GENERAL SUGGESTIONS

These are general suggestions intended for homeowners and small businesses. The keys to minimizing mold include moisture and dust control. **Remodeling may cause very high airborne mold levels.**

1. Remove Visible Mold. Any visible mold should be removed quickly. If large amounts of visible mold are present, appropriate safety precautions should be followed and care should be taken to isolate the area being cleaned. See NYCHD (2000) and Morey (1999). Isolate area and avoid spreading mold around during removal. Use cleaning firms for large problems.
2. Clean Up Water Leaks Within 48 Hours. Water damage can rapidly lead to severe microbiologic growth (bacteria, mold) within a few days. Moisture meters, thermal meters can locate damp spots. Note: Proper drying may take several days.
3. Reduce Excessive Moisture. Relative humidity should be kept below 50% in summer and 35% in winter. Inexpensive relative humidity meters are available. Dehumidifiers are available in many forms, often with automatic controls. Relative humidity should not be reduced below 20%, as this will cause health and static electric problems.
4. Provide Good Drainage. Rain gutters and downspouts with extensions should drain water at least 3' away from building foundations. This includes sump pumps and other water sources. Avoid excessive watering.
5. Check Roofs for Leaks. Roofs, especially flat roofs, are prone to leaks. Check roofs after heavy rain storms and during spring snow melt. Repair small leaks promptly.
6. Check Basement and Crawlspaces. Basements and crawlspaces (including steam tunnels) are often major moisture sources. Good drainage, appropriate waterproofing and vapor barriers should be utilized. Ventilation and/or use of dehumidifiers, HUMIDEX-type systems, etc. may be useful. Use ½ inch gap (capillary break) between concrete floors and sheetrock walls to avoid moisture wicking up into the sheetrock and growing behind the walls. Stiff foam insulation often preferable to fiberglass in basements. Avoid vinyl wallpaper on basement exterior walls.
7. Use Good Building Practices. Consider appropriate insulation, ventilation, vapor barriers, etc. See Lstiburek and Carmody (1994), Beall (1999), Bynum (2001), Kuball (1999). Avoid use of vinyl wallpaper on exterior walls.
8. Check HVAC Ventilation & Insulation. Carbon dioxide levels should not exceed the ASHRAE (1997) guideline of 1000 ppm. Many buildings are tightly sealed and may not provide sufficient outside air. Ventilation systems are often poorly maintained. See HVAC contractors. Consider installing an outside air intake if needed. Attic insulation should be R38 (at least 1 ft of fiberglass or cellulose insulation. Colder air conditioned rooms allow warm humid outside air to condense in attic in summer and vice versa in winter
9. Check Attic Ventilation. Buildings with a lack of attic ventilation may trap moisture. Bath and kitchen fans should be exhausted to the outside and not into the attic. Soffit vents are often plugged up with loose insulation.
10. Optimize HVAC Filtration. Use the most efficient filters available for your system. This includes pleated filters. Note: The HVAC system must be designed to accept high efficiency filters. See HVAC contractors.
11. Have HVAC Ductwork Cleaned. Professional cleaning firms can clean out HVAC systems & duct work.

GEOTEK APPENDIX E CLEANING UP MOLD

WATER CLEAN-UPS - DO IT QUICK BUT DO IT RIGHT!

Water leaks should be cleaned within 24-48 hours. Water wicks quickly into sheetrock and particleboard. Large amounts of mold growth usually take 1-2 weeks or more. Just removing standing water is not enough. Because of this, dehumidifiers are typically needed for several days. The baseboards should often be pulled back and small holes made in the walls to allow drying. Consider commercial cleaning firms for larger jobs.

LARGE MOLD CLEAN-UPS – DON'T STIR UP MOLD!

The main health concern is airborne exposure to high mold levels. **Mold is often not a concern until disturbed.** Remodeling and clean-ups involving opening up walls (especially in basements) often disturb large amounts of mold. This can be a serious health concern. Use commercial cleaning firms for large jobs or rent their equipment and follow their advice.

The proposed area should be isolated from other rooms. Plastic sheeting can be placed over doors and HVAC registers. The room should be placed under negative air (blowing to the outside) or large air scrubbers (air filters) should be used. Respirators (N-95 dust masks or better) should be used.

Before starting clean-up, the cause of the moisture should be identified and corrected. Dehumidifiers should be used if needed to dry out the room. Remove porous moldy materials (sheetrock, particleboard) and bag immediately. Don't carry moldy materials through other rooms. Wipe off moldy non-porous materials (wood, plastic, metal, concrete). This should include the floor, walls and ceiling in the room. Disinfectants can be used but soapy water is often enough. Moldy wood can be sanded. Allow materials to dry. Antimicrobial paints or encapsulants (Bins, Kilz, Perma-White, polyurethane paint) can be used on some surfaces to reduce moisture and future mold growth.

For sheetrock in basements, cut a ½ inch gap (capillary break) between the bottom of the sheetrock and concrete floor to prevent future wicking. Or consider mold resistant materials (cement-fiber board, mold resistant sheetrock, etc). Foam insulation may be better in basements than fiberglass.

WHAT CAN BE CLEANED?

Porous items such as wet sheetrock or particleboard may need to be removed. Clothes and rugs can often be cleaned. However, musty porous furniture and mattresses may need to be discarded. Hard (non-porous) materials can often just be wiped off with a damp cloth. This includes plastic, glass, metal, and wood objects.

Small mold spots can often be wiped off and cleaned with soapy water mixed with a little bleach (one part bleach to 10 parts water). Avoid use of strong chemicals and pure bleach. Check with a commercial cleaning firm for advice (mm3/05).

GEOTEK APPENDIX F

MOLD & WATER CLEANUP FIRMS (2026)

FAIRMONT, MINNESOTA – Indoor Technologies 10 Forgotten Lake Rd. Fairmont, MN 56301. Ph. 507-238-9927. Cell: 507-399-9173 Contacts: Craig Diegnau Services: Mold & water clean-up, duct & carpet cleaning, etc. **MOLD TESTING**

HARRISBURG, SIOUX FALLS – Moxie Services 47070 104th St., Sioux Falls, SD 57032. Ph. 605-644-7900 Contacts: Dan Grossman. Services: Mold remediation, water, clean-up, carpet/rug, duct cleaning; tile shower sealing cleaning. www.moxiesd.com

HARRISBURG, SIOUX FALLS – Mustang Disaster Clean-Up 27283 SD Hwy 115, Harrisburg, SD 57032. Ph. 605-370-1990, Services: Mold remediation, duct cleaning, fire, smoke water, flood restoration. www.mustangdisastercleanup.com

IOWA (Central) – Mustang Disaster Clean-Up 518 Broad St, Story City, IA 50248, Ph. 515-620-3772, Services: Mold remediation, duct cleaning, fire, smoke water, flood restoration. www.mustangdisastercleanup.com

IOWA (YANKTON, SD). – Floor Tec Professional Cleaning Services 220 E. 3rd St., Yankton, SD 57078 Ph. 605-665-4839. Contact Jason Orr, mold & water clean-up, etc. **MOLD TESTING.** www.floorotecrestoration.com

MADISON – Safeguard Home Inspections 22888 449th Ave., Madison, SD 57042, Ph. 605-480-9744. Contact: Dillon Kolbo. Services: Home inspections, Madison, Brookings, Mitchell, Huron and surrounding areas. **MOLD TESTING** <http://www.safeguard-llc.com>

MITCHELL – Floor Tec Professional Cleaning Services 119 Railroad Ave. W, Mitchell, SD 57301 Ph. 605-999-5325. mold & water clean-up, etc. **MOLD TESTING**

NEBRASKA (YANKTON, SD). – Floor Tec Professional Cleaning Services 220 E. 3rd St., Yankton, SD 57078 Ph. 605-665-4839. Contact Jason Orr, mold & water clean-up, etc. **MOLD TESTING.** www.floorotecrestoration.com

NORFOLK, NEBRASKA - Service Master of Norfolk 1118 Riverside Blvd., Norfolk, NE 68701. Ph. 402-379-0357. Services: Mold & water clean-up, duct & carpet cleaning, etc. **MOLD TESTING**

PLATTE – DCR Environmental LLC 400 Delaware Ave., Ste 5, PO Box 47, Platte, SD 57369' Ph 605-971-2327. Services Mold & water clean-up, duct & carpet cleaning, etc. **MOLD TESTING**

RAPID CITY, SIOUX FALLS. – L&L Insulation PO Box 1258, Rapid City, SD 57709, Ph 800-378-4012, Fax 605-343-0936, Contact: Steve VenTeicher Services: Mold remediation, Lead-based paint and asbestos abatement services.

RAPID CITY – Mustang Disaster Clean-Up 870 Seger Dr., Rapid City, SD, 57701. Ph. 605-858-2569 Services: Mold remediation, duct cleaning, fire, smoke water, flood restoration, **MOLD TESTING.** www.mustangdisastercleanup.com

SIOUX CITY, IOWA - Service Master of Sooland, 1905 A St., S. Sioux City, NE 68776. Ph 402-526-5646. Fax 402-494-5035. Services: Mold remediation, water clean-up, **MOLD TESTING**, etc. E-mail: milan.johnson@smsooland.com

SIOUX FALLS - InTek (Interior Technicians, Inc.) 505 N. Harlem, PO Box 1670, Sioux Falls, SD 57101. Ph. 605-334-9716, 1-800-456-5004, fax 605-335-6786 Contacts: for mold - Gaylon Anderson or Chuck Schipper Services: Mold remediation, duct cleaning & inspections, water clean-up, infrared camera moisture scans

SIOUX FALLS – Rainbow Restoration., 4607 N 4th Ave. Ph 605-271-1111. Contact: Wade Hutchinson. Services: water, fire & smoke restoration and cleaning. E-mail" siouxfalls.mitmgr@rainbowrestores.com

SIOUX FALLS - ServiceMaster of Sioux Falls 1201 N Carla Ave., Tea SD 57064. Ph. 605-338-9615. 1-800-245-4622. Services: Mold & water clean-up, duct & carpet cleaning, etc. Contact: Lori Schnasa e-mail: loris@svmp.com, www.servicemastersf.com

SIOUX FALLS – Servpro West Sioux Falls 701 E 48th St., Sioux Falls, SD 57064, Ph. 605-213-3303, Adam Birger, Services: Mold remediation, water, fire, storm restoration, duct cleaning, 24 hr cleaning services, **MOLD TESTING.**

SPIRIT LAKE, IOWA – Steamway of Spirit Lake 1509 Memphis Ave., Unit F, Spirit Lake, IA 51360. Ph. 712-336-2484 Services: Mold & water clean-up, duct & carpet cleaning, etc. **MOLD TESTING**

VERMILLION – Louie's Disaster Restoration P.O. Box 461 Vermillion, SD 57069, ph. 605-624-2485. Services: Mold & water clean-up, duct & carpet cleaning, etc. **MOLD TESTING**

WATERTOWN – Steam Brothers Pro Cleaning 317 W Kemp, Watertown, SD 57201. Ph. 605-882-2348. Contact: Dan Lindner. Services: Mold & water clean-up, duct clean, carpet clean

WATERTOWN – Service Master PO Box 331, Watertown, SD 57201. Ph 605-657-5818. Contact: April Prins. E-mail: april@smwatertown.com. Mold and water clean-up, duct clean, etc. **MOLD TESTING**

YANKTON, SD. – Floor Tec Professional Cleaning Services 220 E. 3rd St., Yankton, SD 57078 Ph. 605-665-4839. Contact Tom Langdon, mold & water clean-up, etc. **MOLD TESTING.** www.floorotecrestoration.com

YANKTON – Intek 827 Hemi Dr. #1, Yankton, SD 57078 Ph. 605-689-2220. Contact: Bruce Tirrell, mold & water clean-up, etc. **MOLD TESTING.** Bruce.t@intekclean.com