



**GEOTEK ENGINEERING
& TESTING SERVICES, INC.**

909 East 50th Street North
Sioux Falls, South Dakota 57104
605-335-5512 • FAX 605-335-0773
1-800-354-5512 www.geotekeng.com

July 23, 2020

Lincoln Co. Court House
104 N Main St.
Canton, SD 57013

Subj: IAQ/Limited Mold Testing Report
Lincoln Co. Court House
104 N Main St.
Canton, SD
GeoTek #20-B47

Mr. John Rombough;

GeoTek performed an indoor air quality (IAQ) site assessment for mold at the referenced location on July 15, 2020. Testing was performed to assess airborne mold and avian pathogen levels due to odor complaints in the old section of the county court house.

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.

Katherine Howard
Project Manager

**INDOOR AIR QUALITY
LIMITED MOLD TESTING**

Site:

Lincoln County Court House
104 N Main St.
Canton, SD

GeoTek #20-B47-4

Prepared by:

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

Tested: July 15, 2020

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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 July 15, 2020. Testing was performed to assess airborne mold and avian pathogen levels due to odor complaints in the old section of the county court house.

Airborne mold levels were found to be normal in the areas tested. The east Attic sample showed spores types and levels consistent with outdoor air infiltration and areas not normally used for human occupation. Three areas of staining were tested for mold growth. A few growths of *Aspergillus* were observed on the sample from Courtroom 3A by the chimney. Mold growth was not indicated on the stains on the Judge's Entrance of Courtroom 3A or in the sample taken from the ceiling of the East Attic.

Avian pathogen testing did not show current contamination in the attic spaces.

Relative humidity was above the recommended ASHRAE (American Society of Heating, Refrigerating & Air Conditioning Engineers) guidelines in the areas tested.

Other indoor air quality parameters measured during our site visit (CO₂, CO, Temp.) did not indicate levels outside of ASHRAE guidelines.

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 performed to assess airborne mold and avian pathogen levels due to odor complaints in the old section of the county court house.

2.0 BACKGROUND INFORMATION

2.1 Site Description/History

The structure is three story, brick building with a large attic and a basement used for paper storage. Mr. Rombough reported that there has been a bat infestation problem in the attics for years. During hot and humid days considerable odor is present emanating from the attic spaces to the lower floors. There have also been roof leaks affecting the attic and the third floor.

3.0 ASSESSMENT RESULTS

3.1 Observations

A GeoTek Staff Scientist, Katherine Howard, arrived on site Wednesday, July 15, 2020 at approximately 8:00 am. Airborne mold samples were collected on all floors of the old section of the court house including the attics and the basement. An exterior sample was collected for

comparison. Three areas of staining were tested for mold growth. Two avian pathogen air samples were collected in the east and west areas of the attic. Bat droppings were present.

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)
3rd Floor – Courtroom 3A	512	70.5°	56.7	0.0
3rd Floor – Judge’s Chambers	535	70.7°	55.1	0.0
Attic East	560	71.5°	54.4	0.0
Attic West	550	71.0°	52.9	0.0
2 nd Floor – Judge’s Chambers	503	71.2°	53.7	0.0
2 nd Floor – Courtroom 2A	529	70.1°	53.1	0.0
2 nd Floor – Court Services Off.	578	70.5°	56.9	0.0
1 st Floor – Clerk of Courts	686	69.9°	53.8	0.0
1 st Floor – Records Storage	544	69.6°	56.8	0.0
Basement – Admin. Storage	518	71.4°	55.2	0.0
Basement – E Clerk of Courts Storage	637	70.4°	58.1	0.0
Basement – W Clerk of Courts Storage	544	71.0°	57.1	0.0
Outside – West	445	68.9°	67.1	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.

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). **The relative humidity readings were above the recommended guidelines in the areas tested.**

4.0 LABORATORY 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

Tape lift samples were collected from one suspect mold contaminated surface.

(Tape) Sample #1: This sample was collected from the ceiling of Courtroom 3A by the chimney. Microscopic examination of the sample revealed the presence of a few growths of *Aspergillus*. *Cladosporium* spores were observed without growth. Mite feces were present. *Aspergillus* is a problem indicating mold.

(Tape) Sample #1: This sample was collected from the door frame around the judge's entrance to Courtroom 3A. Microscopic examination of the sample did not reveal the presence of mold growth or spores.

(Tape) Sample #1: This sample was collected from a damaged area of the east attic ceiling. Microscopic examination of the sample did not reveal the presence of mold growth. *Cladosporium* spores were observed without growth. Mite feces were present.

Below is some information on 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 Mold Testing

A total of 13 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 1. (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*, *Memnoniella*, *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
3rd Floor – Courtroom 3A	07/15/2020	212	<i>Not Detected</i>	53 (25%)	<i>Not Detected</i>
3rd Floor – Judge’s Chambers	07/15/2020	53	53 (100%)	<i>Not Detected</i>	<i>Not Detected</i>
Attic East	07/15/2020	13,223**	7,466* (56%)	693 (5%)	53 (<1%)
Attic West	07/15/2020	1,651	906 (55%)	53 (3%)	53 (3%)
2 nd Floor – Judge’s Chambers	07/15/2020	1,598	373 (23%)	106 (7%)	53 (3%)
2 nd Floor – Courtroom 2A	07/15/2020	692	266 (38%)	<i>Not Detected</i>	<i>Not Detected</i>
2 nd Floor – Court Services Off.	07/15/2020	798	426 (53%)	53 (7%)	<i>Not Detected</i>
1 st Floor – Clerk of Courts	07/15/2020	533	<i>Not Detected</i>	160 (30%)	<i>Not Detected</i>
1 st Floor – Records Storage	07/15/2020	106	<i>Not Detected</i>	<i>Not Detected</i>	<i>Not Detected</i>
Basement – Admin. Storage	07/15/2020	159	53 (33%)	53 (33%)	<i>Not Detected</i>
Basement – E Clerk of Courts Storage	07/15/2020	531	266 (50%)	106 (20%)	<i>Not Detected</i>
Basement – W Clerk of Courts Storage	07/15/2020	159	53 (33%)	53 (33%)	<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, 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 – West** sample collected outside the building reported total mold levels at 9,705 spores/m³. The dominant mold was basidiospores observed at 4,053 spores/m³ (42%). *Cladosporium* was observed at 640 spores/m³ (7%). *Pen/Asp* was observed at 160 spores/m³ (2%).

4.3 Airborne Avian Pathogen Testing

Airborne avian pathogen samples were collected in a cassette and identified by PCR (polymerase chain reaction), a type of analysis used to identify the genetic material of the organism of interest. Data is reported in cell equivalents per cubic meter of air (CE/Unit). Tests were taken using 37 mm polycarbonate cassettes with 0.45 um filters at a calibrated flow rate of 15 liters/minute. Close faced sampling is used to obtain a minimum of 600 L (0.6 m³) of sample. A reference blank is also required.

Bacteria/fungus	AV #1 – Attic East Landing	AV #2 – Attic Over Court Room
Sample Size	1.14 m ³	1.155 m ³
Chlamydophila psittaci	Not Detected (<88 CE/Unit)	Not Detected (<87 CE/Unit)
Cryptococcus neoformans	Not Detected (<88 CE/Unit)	Not Detected (<87 CE/Unit)
Histoplasma capsulatum*	Absent	Absent

* - This organism requires a two-stage PCR method of analysis. As a result, detection can only be reported as “Present” or “Absent”.

Laboratory results are attached in Appendix A.

5.0 CONCLUSIONS/RECOMMENDATIONS

GeoTek performed Indoor Air Quality and Limited Mold Testing at the referenced project site on July 15, 2020.

Airborne mold levels were found to be normal in the areas tested. Unoccupied area such as attics often have mold levels higher than airconditioned spaces as well as considerable outdoor infiltration. Outdoor mold levels are extremely variable during the summer depending upon weather and wind conditions.

Tape samples of areas with visible staining and water damage showed did not show mold growth in the attic or the judge’s entrance to Courtroom 3A. Some *Aspergillus* growth was observed on the wood substrate under the ceiling tiles in Courtroom 3A.

Avian pathogen testing did not show current contamination in the attic spaces.

Relative humidity was above the recommended ASHRAE guidelines in the areas tested.

Other indoor air quality parameters measured during our site visit (CO₂, CO, Temp.) did not indicate levels outside of ASHRAE guidelines.

Roof leaks must be eliminated and new leaks dealt with as soon as they arise. A bat exclusion company may have suggestions for keeping bat infestations down.

After the area is cleaned and decontaminated, one strategy that may help to eliminate the odors emanating from the old wood in the attic would be to seal the wood with paint.

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 an 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

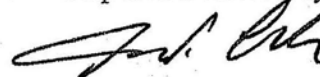
We appreciate the opportunity to be of service to you on this project. Please let us know if you have any questions or if we may be of further assistance.

GEOTEK ENGINEERING & TESTING SERVICES, INC.



Katherine Howard
Project Manager
Staff Scientist

Report Reviewed by:



Jason Cook
Certified Industrial Hygienist
Senior Project Manager