



# ECS Southeast, LLP

Report for Limited Indoor Air Quality Mold Assessment

Spartanburg County Judicial Center  
180 Magnolia Street  
Spartanburg, Spartanburg County, South Carolina  
ECS Project No. 49-4041-E

December 4, 2017





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Mr. Michael Emory, CPPB  
Director of Administrative Services  
Spartanburg County  
P.O. Box 5666  
Spartanburg, SC 29304

Reference: Report for Limited Indoor Air Quality Mold Assessment  
Spartanburg County Judicial Center  
180 Magnolia Street, Spartanburg, South Carolina  
ECS Project Number 49-4041-E

Dear Mr. Emory:

ECS Southeast, LLP (ECS) is pleased to provide you with our report for the limited indoor air quality (IAQ) mold assessment for the above-referenced site. The following narrative summarizes the findings of this assessment, based on information provided to ECS and visual observations made by ECS during the performance of this project.

#### **PROJECT INFORMATION**

The project site consists of the Spartanburg County Judicial Center located at 180 Magnolia Street in Spartanburg, South Carolina. The subject structure was originally constructed in 1957 with renovations occurring from 1992 to 1994. The main portion of the building consists of two stories with a third floor section containing offices and two courtrooms. The structural frame of the building is cast in place concrete with exterior finishes of glazed brick veneer and aluminum curtain walls and are cladded with marble panels or Exterior Insulation Finish Systems (EIFS). Judicial Center employee concerns and complaints prompted an Indoor Environmental Quality Investigation (IEQ) performed by JMAC Environmental, LLC located in Spartanburg, SC from March 22, 2016 to June 2, 2016 and subsequent mold remediation and water incursion corrections occurring from July 22, 2016 to October 23, 2016. JMAC reports titled "Indoor Environmental Quality Remediation, Completed at Spartanburg County Courthouse, JMAC Project #16-320" dated January 5, 2017 and "Indoor Environmental Quality Investigation, JMAC Project #16-270" dated June 20, 2016 were made available to ECS for review prior to the assessment. ECS was requested to perform a limited indoor air quality assessment in March of 2017 after being awarded the project following bid submission to Spartanburg County IFB # 28-17 "Spartanburg County Judicial Center Indoor Air Quality Investigation". The assessment was limited in that sample locations were determined by Spartanburg County personnel and bid documents, and the assessment was to only include the collection and laboratory analysis of air samples for the identification of fungal spore types and concentrations. The old jail portion of the structure was excluded from the scope of work.

In November of 2017, ECS was again requested to perform a limited indoor air quality investigation of the interior of the judicial center, and again the assessment was limited in that sample locations were

determined by Spartanburg County personnel, and the assessment was to only include the collection and laboratory analysis of air samples for the identification of fungal spore types and concentrations. The old jail portion of the structure was again excluded from the scope of work

Mr. Thomas Barnes and Mr. Matthew Wilbanks with ECS mobilized to the site to conduct the limited assessment on November 20 and 27, 2017.

### SCOPE OF SERVICES

ECS was requested to perform a limited indoor air quality mold assessment on the interior of the Judicial Center. The assessment was limited in that sample locations were pre-determined by Spartanburg County personnel, and the assessment was to only include the collection and laboratory analysis of air samples for the identification of fungal spore types and concentrations. The old jail portion of the structure was excluded from the scope of work. Pursuant to this request, ECS conducted the following scope of services:

- Collection of air samples for identification of fungal spore types, fungal spore concentration, and laboratory analysis.
- Testing for carbon dioxide (CO<sub>2</sub>), relative humidity, and temperature to compare results with recommendations contained in American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standard 62-1989 and 55-1981R, Thermal Environmental Conditions for Human Occupancy. An IAQ-CALC™ Indoor Air Quality Meter was used to measure the indoor levels.
- Document the results in a report with an attached map of the sample locations.

### ASSESSMENT INFORMATION AND TESTING RESULTS

ECS representatives, Mr. Thomas W. Barnes, and Mr. Matthew Wilbanks visited the subject site on November 20, and 27, 2017. ECS collected ninety-nine (99) indoor airborne fungal spore samples in the Spartanburg County Judicial Center. Additionally, four (4) outdoor samples were collected within the same time period as the samples collected on the interior of the structure to use for comparison purposes. Air sampling was conducted using Air-O-Cell® “spore-trap” air sampling media. One (1) Buck BioAire™ model B520, and one (1) Zefon Bio-Pump® Plus model ZBP-200 high volume air sampling pumps were calibrated to 15 liters per minute. Air sampling duration was 5 minutes at each of the sample locations. The outdoor samples were collected and used as reference to determine if indoor levels were unusually elevated or if unusual genera were present or predominant indoors.

After collection, the samples were appropriately packaged and submitted to Southeast Environmental Microbiology Laboratories (SEEML) in Greenville, South Carolina for analysis. SEEML is AIHA (American Industrial Hygiene Association) Environmental Microbiology Accredited laboratory for only fungal analysis Air-Direct Examination (EMLAP #173667). Proper chain of custody procedures were maintained throughout the sample collection and transportation process. Copies of the chain of custody are included in the attachments.

The samples were delivered to SEEML in Greenville, South Carolina for analysis. The samples were analyzed for total fungal spores using Direct Microscopy Examination at 400X (100% of Trace Analyzed)

SEEML SOP-7. The following table indicates the predominant fungal spore genus identified at the locations sampled. The SEEML report dated November 22, and 27, 2017 identifies the sample locations and presents a summary of fungal genera identified for the samples.

**Table 1: Microbial Total Spore Count Air Sample Locations and Data, November 20, and 27, 2017 Site Visit**

<b>Sample Location of Air-O-Cells®</b>	<b>Total Spore Count (spores/m<sup>3</sup>) / Predominant Genus Identified</b>
Outside, @ Oak Tree, In Mulch (11/20/17)	4,570 / <i>Basidiospores</i>
801-JJ	871 / <i>Cladosporium</i>
801-DD	169 / <i>Basidiospores</i> ,
801-MM	546 / <i>Basidiospores</i>
801-NN	208 / <i>Cladosporium</i>
801-PP	403 / <i>Basidiospores</i>
801-Z	416 / <i>Basidiospores</i>
Solicitors Conf. Rm	169 / <i>Penicillium/Aspergillus</i>
801-W	39 / <i>Cladosporium</i>
801-L	234 / <i>Cladosporium</i>
801-K	273 / <i>Basidiospores</i>
801-J	234 / <i>Basidiospores</i>
801-H	143 / <i>Penicillium/Aspergillus</i>
801-G	390 / <i>Basidiospores</i>
801-F	273 / <i>Penicillium/Aspergillus</i>
801-P	468 / <i>Penicillium/Aspergillus</i>
801-O	182 / <i>Penicillium/Aspergillus</i>
801-D	403 / <i>Penicillium/Aspergillus</i>
Secretarial Pool	208 / <i>Penicillium/Aspergillus, Basidiospores</i>
801-S	546 / <i>Basidiospores</i>
801-C	312 / <i>Basidiospores</i>
801-B	234 / <i>Basidiospores</i>
901-A	221 / <i>Cladosporium</i>
901 Suite	273 / <i>Basidiospores</i>

Sample Location of Air-O-Cells®	Total Spore Count (spores/m <sup>3</sup> ) / Predominant Genus Identified
901 Court	338 / <i>Penicillium/Aspergillus</i>
Men's Staff Rest Room	286 / <i>Penicillium/Aspergillus</i>
Women's Staff Rest Room	390 / <i>Basidiospores</i>
1100-E	806 / <i>Penicillium/Aspergillus</i>
1100-C	325 / <i>Penicillium/Aspergillus</i>
1100-G	403 / <i>Penicillium/Aspergillus</i>
1100-K	182 / <i>Penicillium/Aspergillus</i>
Family Court Waiting Room	351 / <i>Cladosporium</i>
502-A	767 / <i>Cladosporium</i>
401	559 / <i>Cladosporium, Stachybotrys</i>
401-A	1,770 / <i>Penicillium/Aspergillus, Stachybotrys</i>
407	1,160 / <i>Penicillium/Aspergillus, Stachybotrys</i>
408	598 / <i>Penicillium/Aspergillus, Stachybotrys</i>
410	130 / <i>Cladosporium</i>
412-A	91 / <i>Cladosporium</i>
412	1,080 / <i>Basidiospores</i>
411-A	221 / <i>Basidiospores</i>
511-B	741 / <i>Penicillium/Aspergillus</i>
Assistant COC Office	325 / <i>Basidiospores</i>
Evidence Room	585 / <i>Basidiospores</i>
Storage Room	871 / <i>Penicillium/Aspergillus</i>
602	442 / <i>Basidiospores</i>
Courtroom Lobby	351 / <i>Basidiospores</i>
601	507 / <i>Basidiospores</i>
605	312 / <i>Basidiospores, Cladosporium</i>
Judge Knie's Chamber	689 / <i>Basidiospores, Stachybotrys</i>
615	325 / <i>Basidiospores,</i>
611-A	806 / <i>Basidiospores,</i>

Sample Location of Air-O-Cells®	Total Spore Count (spores/m <sup>3</sup> ) / Predominant Genus Identified
Court Reporters Hallway	416 / <i>Basidiospores</i> ,
Court Reporters Office C	1,130 / <i>Penicillium/Aspergillus</i>
Court Reporters Office B	897 / <i>Basidiospores</i>
Jury Assembly Room	481 / <i>Cladosporium</i>
Judge Hayes' Chamber	182 / <i>Cladosporium</i>
Judge Cole's Chamber	416 / <i>Basidiospores</i>
514-B	429 / <i>Basidiospores, Cladosporium</i>
Jury Room C	1,070 / <i>Basidiospores</i>
512-A	585 / <i>Basidiospores</i>
Judge Beatty's Chamber B	416 / <i>Basidiospores</i>
Judge Beatty's Chamber C	572 / <i>Basidiospores</i>
Judge Beatty's Chamber A	793 / <i>Basidiospores</i>
Judge Beatty's Chamber D	117 / <i>Cladosporium</i>
Sherriff CT DWA	364 / <i>Cladosporium, Stachybotrys</i>
107-C	507 / <i>Cladosporium</i>
107-D	1,040 / <i>Basidiospores</i>
107-E	1,260 / <i>Penicillium/Aspergillus</i>
107-B	498 / <i>Basidiospores</i>
107 F	663 / <i>Basidiospores</i>
105-A	273 / <i>Basidiospores</i>
105-B	455 / <i>Penicillium/Aspergillus</i>
110	702 / <i>Basidiospores</i>
106	637 / <i>Basidiospores, Cladosporium</i>
103	624 / <i>Basidiospores</i>
1 <sup>st</sup> Floor Security Office	403 / <i>Basidiospores</i>
114 E	676 / <i>Penicillium/Aspergillus</i>
114 D	1,090 / <i>Basidiospores</i>
302	1,090 / <i>Basidiospores</i>

Sample Location of Air-O-Cells®	Total Spore Count (spores/m <sup>3</sup> ) / Predominant Genus Identified
302-C	1,090 / <i>Basidiospores</i>
302-A	845 / <i>Basidiospores</i>
302-B	1,040 / <i>Basidiospores, Stachybotrys</i>
File Room 302-F	1,270 / <i>Basidiospores</i>
302-H	689 / <i>Basidiospores</i>
Small Probate Courtroom	481 / <i>Cladosporium</i>
302-I	780 / <i>Penicillium/Aspergillus, Stachybotrys</i>
Judge Kelly's Suite	676 / <i>Penicillium/Aspergillus, Stachybotrys</i>
Judge Kelly's Chamber	403 / <i>Basidiospores</i>
COC File Room A	247 / <i>Basidiospores, Cladosporium</i>
Empty Office E	559 / <i>Basidiospores</i>
402-A	923 / <i>Basidiospores</i>
402	1,990 / <i>Basidiospores</i>
302-O	1,260 / <i>Basidiospores</i>
Old Mechanical Room Hallway	2,240 / <i>Basidiospores</i>
EOC-D	650 / <i>Basidiospores</i>
EOC-A	962 / <i>Basidiospores</i>
112	585 / <i>Basidiospores</i>
104-D	1220 / <i>Basidiospores</i>
Outside @ Oak Tree, in Mulch (11/20/17)	4,420 / <i>Basidiospores</i>
Outside @ Oak Tree, in Mulch (11/27/17)	8,630 / <i>Basidiospores</i>
COC Office	1,000 / <i>Basidiospores</i>
Outside @ Oak Tree, in Mulch (11/27/17)	8,630 / <i>Basidiospores</i>

	Indicates sample with <i>Penicillium/Aspergillus</i> concentration greater than 1,000 spores/M <sup>3</sup> compared to outside concentration or any interior spore concentrations of <i>Stachybotrys</i> - <b>Amplified Spore Concentration</b>
	Indicates sample with one or more spore genus/genera concentration(s) greater than same genus/genera concentration(s) found outside <b>Slightly Amplified Spore Concentration</b>
	Indicates sample with spore concentrations lower than spore concentrations found outside- <b>No Amplified Spore Concentrations</b>

As shown in the table above;

There are nine (9) areas that have a laboratory reported concentrations of *Stachybotrys* (results in Table 1 and areas on the attached maps highlighted in pink). These nine (9) areas are as follows:

- 401
- 401-A
- 407
- 408
- Judge Knie's Chamber
- Sherriff CT DWA
- 302-B
- 302-I
- Judge Kelly's Suite

The remaining ninety (90) areas sampled have reported spore concentrations less than the reported spore concentrations found outside (results in Table 1 and areas on the attached maps highlighted in green), and ECS would consider these areas as areas with no amplified spore concentrations.

Air sample results are calculated based on counts per cubic meter of air (counts/m<sup>3</sup>). To date, action levels have not been established for particulate concentration levels identified on Air-O-Cell Cassettes; however, comparative spore type concentrations are made between indoor "suspect areas" and "non-suspect" areas in and/or outside of the building. According to the American Industrial Hygiene Association "*Recognition, Evaluation, and Control of Indoor Mold*", 2008 (the Green Book), generally fungal spore taxa from complaint and non-complaint or outdoors should qualitatively be similar and indoor concentrations should be generally lower than those of outdoors. Please note that mold is naturally occurring and ubiquitous in the environment. Mold is also not presently regulated in the State of South Carolina with respect to acceptable concentrations or permissible exposure limits of any species.

*Cladosporium* species have a world-wide distribution and are among the most common air-borne fungi. Some 500 species have been described. *Cladosporium* species are frequently isolated as contaminants. Colonies are rather slow growing, mostly olivaceous-brown to blackish brown but also sometimes grey, buff or brown, suede-like to floccose, often becoming powdery due to the production of abundant conidia. *Cladosporium* produces a black pigment so that when it grows on a surface it looks black. *Cladosporium* grows well on cellulose surfaces. *Cladosporium* often found growing outside in soil, plant litter and decaying plants as well as on leaves, inside growing on textiles, wood, moist window sills, tile grout and often in bathrooms where the relative humidity is regularly above 50%. *Cladosporium* also can be found growing on sheetrock, sub floor, OSB and plywood among other surfaces.

*Aspergillus* is a genus consisting of several hundred mold species found in various climates worldwide. Some species can cause infection in humans and other animals. Some infections found in animals have been studied for years. Some species found in animals have been described as new and specific to the investigated disease and others have been known as names already in use for organisms such as saprophytes. More than 60 *Aspergillus* species are medically relevant pathogens. For humans there are a range of diseases such as infection to the external ear, skin lesions, and ulcers classed as mycetomas. *Aspergillus* species are common contaminants of starchy foods (such as bread and potatoes), and grow



in or on many plants and trees. *Aspergillus niger* is a can be found growing on damp walls, as a major component of mildew.

*Penicillium* is one of the most common fungal genera with worldwide distribution. There are approximately 200+ species of *Penicillium*. The genus *Penicillium* (in general) has a rapid growth rate. Colonies are usually green, blue-green, or grey green, but can be white, yellow or pinkish. Colonies are mostly velvety to powdery in texture. *Penicillium* often produces microbial volatile organic compounds (MVOC's) that give the distinctive heavy, musty odor. *Penicillium* spores are also commonly found in house dust. *Penicillium* species are most commonly found in soils, cellulose materials (plants, wood, paper, etc.), foods, grains, and compost piles. Indoors *Penicillium* can be associated with carpet, wallpaper, organic substances, and is also known to grow within fiberglass duct insulation. *Penicillium* grows in water damaged buildings on wallpaper, wallpaper glue, decaying fabrics, moist chipboards, and behind paint.

*Stachybotrys* is slow growing as compared to *Penicillium* and other common mold genera, and may not compete well in the presence of other fungi. However, when water availability is high for prolonged periods on environmental material, *Stachybotrys* may gradually become the predominating mold, especially on cellulose containing materials such as soil, decaying plant substrates, decomposing cellulose (hay, straw), leaf litter, and seeds.

*Basidiospores* usually grow outdoors on organic matter, they are occasionally found indoors and are infrequently detected growing in potted plants, bathrooms, carpeting, textiles, walls and anything made of wood. Most *basidiospores* are dispersed by wind and are released either passively (i.e. puffballs) or forcibly (i.e. mushrooms). *Basidiomycota* are found in virtually all terrestrial ecosystems, as well as freshwater and marine habitats. The fungi grow on a variety of substrates and their modes of nutrition are also variable. Nutrients are obtained from living, decaying or non-living substrates. A large number of mushrooms grow symbiotically with plants. Most wood decay or wood rot fungi are also in this group and they break down complex carbohydrates that very few organisms can utilize. These are the basidiomycetes that can cause destructive dry rot and structural damage.

Source: EMLab

### Indoor Comfort Parameters

Temperature, relative humidity and Carbon Dioxide levels were measured during our assessment utilizing a TSI IAQ-Calc™ Model 7545 hand held meter.

Table 2: Indoor Comfort Parameters, Location and Data, November 20, and 27, 2017 Site Visit

Sample Location	Temperature (°F)	CO2 (PPM)	Relative Humidity (%)
Outside (11/20/17)	49.8	429	34.7
801-JJ	66.2	726	31.4
801-DD	66.5	721	31.5

Sample Location	Temperature (°F)	CO2 (PPM)	Relative Humidity (%)
801-MM	67.5	634	29.5
801-NN	68.0	636	28.5
801-PP	68.4	685	27.9
801-Z	68.8	637	26.9
Solicitors Conf. Rm	68.3	576	24.7
801-W	68.5	627	27.9
801-L	68.9	637	27.5
801-K	68.7	782	28.7
801-J	68.6	869	28.9
801-H	68.3	735	30.2
801-G	68.8	742	29.6
801-F	68.4	811	30.7
801-P	68.2	804	31.2
801-O	69.7	809	29.2
801-D	69.9	834	29.9
Secretarial Pool	69.9	909	30.4
801-S	70.0	942	30.5
801-C	70.5	886	29.5
801-B	70.8	847	28.3
901-A	71.5	729	24.7
901 Suite	71.0	885	25.6
901 Court	70.9	789	26.4
Men's Staff Rest Room	73.1	967	24.6
Women's Staff Rest Room	73.5	834	25.2
1100-E	71.1	1050	31.4
1100-C	69.8	960	32.3
1100-G	67.7	989	36.0
1100-K	67.4	880	36.2
Family Court Waiting Room	70.5	796	25.9

Sample Location	Temperature (°F)	CO2 (PPM)	Relative Humidity (%)
502-A	71.6	1172	31.6
401	67.8	627	28.1
401-A	67.6	675	28.8
407	68.6	627	28.1
408	68.6	535	23.8
410	69.6	629	24.2
412-A	70.8	561	26.9
412	71.6	559	27.0
411-A	71.0	699	24.4
511-B	71.6	1093	31.2
Assistant COC Office	71.6	1064	28.3
Evidence Room	66.6	575	29.1
Storage Room	67.2	538	24.5
602	67.1	463	21.0
Courtroom Lobby	67.5	556	23.2
601	67.5	450	21.2
605	67.5	437	20.0
Judge Knie's Chamber	74.8	540	20.7
615	73.7	509	18.9
611-A	71.1	505	21.7
Court Reporters Hallway	71.9	802	23.9
Court Reporters Office C	74.9	554	21.5
Court Reporters Office B	76.5	612	20.5
Jury Assembly Room	72.9	583	22.2
Judge Hayes' Chamber	68.9	600	26.9
Judge Cole's Chamber	69.5	590	27.3
514-B	70.7	706	24.4
Jury Room C	70.2	526	21.4
512-A	69.8	717	25.4

Sample Location	Temperature (°F)	CO2 (PPM)	Relative Humidity (%)
Judge Beatty's Chamber B	71.8	569	23.8
Judge Beatty's Chamber C	70.5	646	26.6
Judge Beatty's Chamber A	71.3	579	24.3
Judge Beatty's Chamber D	72.0	553	21.7
Sherriff CT DWA	70.2	649	23.1
107-C	72.6	795	26.5
107-D	72.8	740	26.7
107-E	71.6	875	27.1
107-B	71.2	807	26.3
107 F	71.8	902	28.0
105-A	71.0	801	27.0
105-B	70.2	822	27.8
110	70.8	644	30.0
106	71.7	909	31.6
103	70.3	952	28.6
1 <sup>st</sup> Floor Security Office	69.8	880	27.8
114 E	71.5	825	25.3
114 D	71.5	763	25.8
302	72.7	928	25.3
302-C	73.1	912	24.9
302-A	72.9	824	23.8
302-B	72.8	977	33.5
File Room 302-F	72.6	1072	29.9
302-H	72.6	928	25.7
Small Probate Courtroom	72.7	845	27.8
302-I	73.4	920	26.7
Judge Kelly's Suite	71.2	747	25.4
Judge Kelly's Chamber	71.0	792	26.5
COC File Room A	70.4	1,362	36.8

Sample Location	Temperature (°F)	CO2 (PPM)	Relative Humidity (%)
Empty Office E	71.9	822	26.0
402-A	68.5	583	24.1
402	67.6	590	25.0
302-O	Not Collected		
Old Mechanical Room Hallway	Not Collected		
EOC-D	66.2	607	33.1
EOC-A	65.6	499	33.7
112	67.6	686	30.0
104-D	68.5	787	30.9
Outside (11/20/17)	59.9	474	27.8
Outside (11/27/17)	64.2	397	22.1
COC Office	67.7	831	28.9
Outside (11/27/17)	65.9	417	18.5

Indoor parameters measured were generally acceptable. As cited by NIOSH, the *ANSI/ASHRAE Standard 55-2013: Thermal Environmental Conditions for Human Occupancy* specifies the combinations of indoor environmental and personal factors that produce acceptable thermal conditions to a majority of occupants within a space [ANSI/ASHRAE 2013b]. Assuming slow air movement (less than 40 feet per minute) and 50% indoor relative humidity, the operative temperatures recommended by ASHRAE range from 68.5°F to 75°F in the winter, and from 75°F to 80.5°F in the summer. The difference in temperature ranges between the seasons is largely due to clothing selection. Temperatures measured on the interior of the Judicial Center were generally acceptable.

ASHRAE also recommends that indoor relative humidity be maintained at or below 65% [ANSI/ASHRAE 2013b]. US EPA recommends maintaining indoor relative humidity between 30 and 60% to reduce mold growth [EPA 2012]. A majority of the interior spaces measured for relative humidity during the assessment had relative humidity levels below the EPA recommended minimum of 30%. According to the USEPA's "*An Office Building Occupants Guide to Indoor Air Quality*", Humidity levels that are too low may contribute to irritated mucous membranes, dry eyes and sinus discomfort.

ANSI/ASHRAE 62 also recommends that indoor carbon dioxide (CO<sub>2</sub>) levels be no higher than 700 parts per million (ppm) above the outdoor concentrations. The average outdoor concentration was 430 ppm. The CO<sub>2</sub> concentrations in the interior of the structure ranged from 437 to 1,362 ppm with 2 areas above the recommended range. The areas above the recommended range were the Clerk of Court's File Room A and Room 502-A.

## CONCLUSIONS AND RECOMMENDATIONS

Based on laboratory analysis on November 22, and 27, 2017 and from our site visits on November 20, and 27, 2017, ECS found the following;

There are nine (9) areas that have a laboratory reported concentrations of *Stachybotrys* (results in Table 1 and areas on the attached maps highlighted in pink). These nine (9) areas are as follows:

- 401
- 401-A
- 407
- 408
- Judge Knie's Chamber
- Sherriff CT DWA
- 302-B
- 302-I
- Judge Kelly's Suite

The remaining ninety (90) areas have reported spore concentrations less than the reported spore concentrations found outside (results in Table 1 and areas on the attached maps highlighted in green), and ECS would consider these areas as areas with no amplified spore concentrations.

ASHRAE recommends that indoor relative humidity be maintained at or below 65% [ANSI/ASHRAE 2013b]. US EPA recommends maintaining indoor relative humidity between 30 and 60% to reduce mold growth [EPA 2012]. A majority of the interior spaces measured for relative humidity during the assessment had relative humidity levels below the EPA recommended minimum of 30%. According to the USEPA's "*An Office Building Occupants Guide to Indoor Air Quality*", Humidity levels that are too low may contribute to irritated mucous membranes, dry eyes and sinus discomfort.

ANSI/ASHRAE 62 also recommends that indoor carbon dioxide (CO<sub>2</sub>) levels be no higher than 700 parts per million (ppm) above the outdoor concentrations. The average outdoor concentration was 430 ppm. The CO<sub>2</sub> concentrations in the interior of the structure ranged from 437 to 1,362 ppm with 2 areas above the recommended range. The areas above the recommended range were the Clerk of Court's File Room A and Room 502-A.

Based on our findings, ECS recommends the following;

### **Areas Identified with Amplified Spore Concentration (Highlighted in Pink) Further Invasive Investigation and Cleaning Recommended**

Based on the non-viable air sample results, one (1) to three (3) spore(s) of *Stachybotrys* was/were found and concentrations of all other genera were below outside concentrations, and further investigation of these rooms is warranted. ECS would recommend the following:

- The doors to the rooms and the HVAC supply and return vents be sealed.
- Moisture testing and infrared thermography of the drywall wall materials of the walls with particular emphasis of walls facing the exterior to attempt to locate potential areas of water

intrusion. In addition, the insides of the HVAC fiberglass duct board ducts (if present) should be investigated as a possible source of the amplification. If areas of suspected water intrusion are found, in an effort to be as non invasive and destructive as possible, ECS would recommend cutting a small access point 3" x 3" square in the wall(s), large enough for direct observation, and the collection of bulk (swab) samples to identify the presence of potential mold growth. Any access points would be taped over to limit the migration of mold spores (if present) into the rooms.

- General adherence to the "Fungal Remediation Protocol" written for the Masters in Equity and Magistrate's offices, ECS Project Number 49-4041-A dated May 4, 2017
- Removal of any mold or water impacted building materials that are found.
- After the removal of impacted building materials, or if no source of the amplification is found, we recommend a cleaning of the areas to include HEPA vacuuming of floors and walls, and a wet wipe utilizing an EPA approved microbial disinfectant of all hard surfaces in the room.
- HVAC systems (including supply and return vents) servicing the impacted rooms should be cleaned according to the National Association for Duct Cleaning (NADC) standards.
- After the cleaning, ECS would recommend application of an EPA approved fog, and after which, running HEPA scrubbers for 24-48 hours with the doors to the rooms closed (or zippered), and additional non-viable air clearance sampling after the scrubbers have run.

In addition to the recommendations for the rooms with concentrations of *Stachybotrys*, ECS recommends the following efforts structure wide.

- Maintain CO<sub>2</sub> and relative humidity levels at ASHRAE / EPA recommended ranges.
- Continue the maintenance of HVAC filters and fan coils to include the installation of filters with a Minimum Efficiency Reporting Value (MERV) of 8-10 and the routine cleaning of fan coils as routine and frequent maintenance may reduce overall spore concentrations structure wide.
- Routine inspection and correction of water intrusion routes including but not limited to window seals, ground to wall flashings, brick and mortar joints, and the seals between the curtain wall and adjoining glazed brick.

### **General Recommendations For Maintaining Acceptable Indoor Air Quality**

The key to preventing microbial impact is moisture control. Below is a list of preventative measures to control moisture and assist in maintaining acceptable indoor air quality:

- Periodically perform O&M on the HVAC unit to include changing filters, cleaning coils, etc. according to the manufacturer's recommendations.
- Operate the HVAC within manufacturer's recommended guidelines.
- Respond to moisture intrusion events as soon as they are discovered.
- Identify and correct all moisture issues including excessive humidity for the building.
- Confirm that exterior moisture intrusion concerns have been addressed.

It should be noted that fungi and fungal spores are ubiquitous to the environment. Remediation of identified fungal material in a structure is not sufficient to ensure that amplification will not re-occur if moisture intrusion sources are not correctly identified and corrected.

## QUALIFICATIONS AND LIMITATIONS

Our testing protocols and recommendations are based on guidelines outlined in *Bioaerosols Assessment and Control*, dated 1999 prepared by the American Conference of Governmental Industrial Hygienists as well as the Institute of Inspection, Cleaning and Restoration (IICRC), *IICRC S520; Standard and Reference Guide for Professional Mold Remediation*. Please note that fungal spores are living organisms that require a source of water and carbon/cellulose based materials for growth. The most permanent long-term solution to prevent microbial recurrence is to eliminate and control water infiltration (moisture, excessive humidity, plumbing leaks, condensation, etc.) and to dry areas immediately (within 24 hours of occurrence) if water infiltration is detected or evident.

Our visual assessment does not imply a guarantee that all possible areas of microbial growth were identified. Impacted building materials may be hidden by walls, flooring, partitions, etc. Observations were obtained without the use of destructive testing. Observations made of building conditions which may adversely affect indoor air quality within the building were made of building materials and or mechanical system components in plain view. Should more information be required to better identify problems within the facility, destruction of building finish materials may be necessary. This survey is not intended to represent an exhaustive research of every potential hazard or condition that may exist, nor does it claim to represent indoor conditions or events that arise after the survey.

This report summarizes our evaluation of the conditions observed in the building on the day of testing. Our findings are based on observations at the site and analysis of a limited number of samples obtained in random locations. Conditions discovered which deviate from the data contained in this report or the specific fungal abatement objective should be presented to us for our evaluation. The findings of this evaluation are not intended to serve as an audit of health and safety or compliance issues pertaining to improvements or activities on-site. ECS is not responsible or liable for the discovery and elimination of hazards that may potentially cause damage, accidents, or injuries. No warranty, expressed or implied, is made with regard to the conclusions presented within this report.

This report is provided for the exclusive use of the addressee. The scope of services performed in the execution of this evaluation may not be appropriate to satisfy the needs of other users. This report is not intended to be used or relied upon in connection with other projects or by other unidentified third parties without the written consent of ECS. The use of this report by any undesignated third party or parties will be at such party's sole risk and ECS disclaims liability for any such third party use or reliance.

ECS has not used client-provided predetermined language to report the conclusions of this work and it is our understanding that ECS will not be required to do so in any manner. The conclusions and recommendations presented in this report are based on a reasonable level of evaluation within the normal bounds and standards of professional practice for an evaluation of this nature in this area. The recommendations have no relationship to insurance coverage. This document is not a legal mandate and should be used as a guideline only.

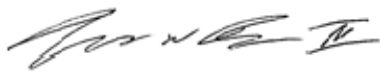


**CLOSING**

ECS appreciates the opportunity to provide our services for this project and we thank you for utilizing ECS as your consultant. The conclusions and methodologies presented within this letter report were provided in accordance with the contractual terms of agreement for this project and within accepted standard practices for this geographic setting. If you have comments or questions, please feel free to contact us.

Respectfully,

**ECS SOUTHEAST, LLP** as represented by:



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Attachments: Sample Location Maps  
Laboratory Data and Chains of Custody