



August 28, 2023

Dare County Schools
Ian Adams
3020 S. Wrightsville Avenue
Nags Head, NC

**Re: Limited Environmental Post Remediation Clearance Investigation with Airborne and Surface Fungal Sampling at First Flight Middle School, Kill Devil Hills, NC
LRC Project – 23-1831**

At your request, on August 22, 2023, LRC Indoor Testing & Research, Inc. (LRC) performed a limited environmental fungal post remediation clearance inspection that included airborne and surface fungal sampling at the property listed above. This project was requested to characterize the types and levels of airborne and surface fungi in the structure. This fungal inspection was requested at the completion of remediation in the structure.

LRC performs all water-damage and fungal investigations with sampling and recommendations in accordance with guidelines published in *Bioaerosols: Assessment and Control*, by the American Conference of Governmental Industrial Hygienists (ACGIH), in *Mold Remediation in Schools and Commercial Buildings* by the United States Environmental Protection Agency (USEPA), and in the currently recognized and accepted industry standards including the ANSI/IICRC S500 *Standard and Reference Guide for Professional Water Damage Restoration*, Fourth Edition (S500) and the ANSI/IICRC S520 *Standard and Reference Guide for Professional Mold Remediation*, Third Edition (S520).

Our inspection included the following:

1. Visual inspection of the remediated areas.
2. Collect representative moisture measurements in inspected areas.
3. Measure temperature and relative humidity indoors and outdoors.
4. Collect representative non-viable spore trap air samples indoors and one outdoors for comparison.
5. Collect representative non-viable surface tape lift samples of representative visible or suspect fungal growth if deemed necessary.
6. Provide a written report describing the survey results and comparing those results to accepted guidelines and directives. This report includes a summary of data, Certificates of Laboratory Analysis and a remediation protocol, if needed, based on the ANSI/IICRC S520 *Standard and Reference Guide for Professional Mold Remediation*, Third Edition (S520).

VISUAL INSPECTIONS, MOISTURE MEASUREMENTS, AND RELATIVE HUMIDITY

A calibrated moisture meter was used to measure moisture levels on representative hard surfaces. Typically, moisture contents approaching 17% and greater represent excessive moisture on hard surfaces (wood) in conditioned spaces; however, in non-conditioned spaces wood and semi-porous materials may approach these threshold levels naturally due to seasonal changes in temperature and humidity.

The temperature and relative humidity are summarized in Table A below. The relative humidity did not meet the current ASHRAE Standard to maintain indoor relative humidity below 65% in all areas of the building. It should be noted that dehumidifiers were operating throughout the building during this inspection. It is suspected that the humidity was very elevated before the operation of dehumidifiers.

Table A – Temperature and Relative Humidity by Location

Location	Temperature	Relative Humidity
Outdoor Air – a.m.	86°F	67%
Hallway – front	76°F	62%
Hallway – middle	76°F	60%
Hallway – rear	76.8°F	63%
Hall L	76.5°F	59.7%
Hall M	76°F	64%
M 110	76°F	73%
Hall K	76°F	64%
Hall L2	77°F	68%
Hall 8	76°F	68%
Hall H	75°F	61%
K127	71°F	73.2%
Media Room	74.8°F	69%
Hall 109	73°F	68%
Outdoor Air pm	90°F	68%

Descriptions in this report are based on looking at the structure from the main entrance door.

General Observations:

The studied property is a single-story building used as a middle school. On the day of this inspection, the school was not occupied by students. Contents were in place. HEPA filtered air scrubbers and dehumidifiers were in place throughout the building. It was reported that remediation activity was requested due to elevated relative humidity issues in the building with resulting visible fungal growth. The remediation company was onsite during this clearance inspection.

Classrooms inspected were visually clean unless otherwise noted. Areas measured with the moisture meter were in the dry range. HEPA filtered air scrubbers in place in classrooms were turned off prior to the collection of air samples.

Staining was noted on some of the acoustic ceiling tiles throughout the building. Addressing the tiles was not a part of the scope of this remediation. These tiles should be removed and replaced as time allows and the areas above inspected. This clearance inspection was limited to the remediated areas of the structure.

The following were four areas of special concern noted during the inspection and sampling:

M110 – The initial air sample collected in this classroom (Sample 06) did not meet clearance criteria. Two surface samples taken of previously cleaned surfaces on contents (Samples 20 and 21) met clearance criteria with only occasional settled fungal spores present. Surface Sample 22 taken in a sink cabinet that had not been part of the initial cleaning contained Numerous *Penicillium/Aspergillus* spores which were the same types of spores found in the air sample. The cabinets were removed and the air and surfaces re-cleaned. A second air sample (Sample 14) taken prior to the air being cleaned again also did not meet clearance criteria. Air scrubbers were then put in place and operated for a period of time. A final air sample (Sample 16) was taken which did meet clearance criteria. Sample results are summarized below and detailed in the attached Certificates of Laboratory analysis.

In Classroom H109 visible fungal staining was found in a sink cabinet base. The cabinet was cleaned and the visible staining was removed. The initial air sample taken Hallway H outside of this room (Sample 10) had a very low spore count, but the spores were almost all *Penicillium/Aspergillus* spores. Additional air cleaning was done in this hallway and rooms. A second air sample taken (Sample 16) did meet clearance criteria showing a ‘normal fungal ecology’.

The initial sample taken in the Media Center (Sample 12) did not meet clearance criteria for the same reason as the H Hallway. There was visible staining found on some porous chairs in the room along with vinyl computer cases. Those items were removed and the air was cleaned for a period of time. The final air sample taken following the removal of stained items, re-cleaning the room and operating air scrubbers (Sample 17) met clearance criteria.

In Classroom H109, the bookcase in question had been removed. The sheetrock in the area measured dry at 8 to 10% moisture content with no visible staining noted. The concrete block and been cleaned and encapsulated, it measured in the dry range. An air sample taken in the room (Sample 13) met clearance criteria.

During removal of equipment and final walk-thru impacted contents were found in a closet in Room M110. Contents were removed and bagged in heavy poly vinyl. The closet was cleaned and air scrubbers allowed to cleanse the air. An air sample collected in the closet (Sample 19) showed a ‘normal fungal ecology’.



Representative classroom



Representative staining on an acoustic ceiling tile

SAMPLING METHODOLOGY

Air Samples:

Currently there are no regulations regarding acceptable airborne fungal levels. Airborne fungal spores are ubiquitous in the outdoor and indoor environment. The guidelines followed in this report for the assessment and/or remediation of airborne and surface fungi are published in *Bioaerosols: Assessment and Control*, by the American Conference of Governmental Industrial Hygienists (ACGIH), in *Mold Remediation in Schools and Commercial Buildings* by the United States Environmental Protection Agency (USEPA), in *Recognition, Evaluation, and Control of Indoor Mold* by the American Industrial Hygiene Association (AIHA), and in the ANSI/IICRC S520 *Standard and Reference Guide for Professional Mold Remediation*, Third Edition (S520). Airborne fungal assessments are performed by comparing results from volumetric samples taken indoors to samples taken outdoors. Airborne fungi levels in non-problem indoor environments generally are less than or approximately the same as that outdoors and also show a similar composition and/or taxonomic predominance. Problems are usually implicated in the indoor air when one or more fungal genera or species are present in a much greater concentration indoors compared to outdoors. Sampling results are shown in the Certificates of Laboratory Analysis attached to this report. Results are discussed below.

Surface Samples:

Surface sampling results should follow guidelines as stated in the ANSI/IICRC S520 *Standard and Reference Guide for Professional Mold Remediation*, Third Edition (S520). Under normal circumstances, building materials that appear clean and free of dirt, water damage, and/or fungal amplification should show “Condition 1” or “normal fungal ecology”. Condition 1 is described in the Standard as “an indoor environment that may have settled spores, fungal fragments or traces of actual growth whose identity, location and quantity are reflective of a normal fungal ecology for a similar indoor environment”. Results from sampling “clean” surfaces, if performed, should show that there is no evidence of fungal amplification. Condition 2 is described as “an indoor environment which is primarily contaminated with settled spores that were dispersed directly or indirectly from a Condition 3 area, and which may have traces of actual growth”. Condition 3 is described as “an indoor environment contaminated with the presence of actual mold growth and associated spores”. Representative surface tape lift samples were collected as discussed below. Surface samples may be taken either with a tape lift or a swab and are analyzed microscopically. Sampling results are shown in the Certificates of Laboratory Analysis attached to this report. Results are discussed below.

SAMPLING RESULTS

Total Non-Viable Spore Air Sample Results:

Representative samples were taken for total airborne fungal spores with a calibrated Buck spore trap. Total airborne fungal spore sample volumes were 75-liters. The outdoor total fungal spore level in the sample collected in the morning (Sample 18) was measured at 3867 Spores/m³ and was comprised of Ascospores (43%), *Cladosporium* (21%), Basidiospores (17%), *Curvularia* (8%), *Penicillium/Aspergillus* group (6%), Smuts (2%), and 1% or less of various other fungal spores. The air sample results are summarized below in Table B.

Table B – Air Sampling Results

Sample #	Location	Total Airborne Spore Count (Spores/m³)	*Non-Fungal Background Particulate Level
01	Main Hallway – front	80	Low
02	Main Hallway – middle	67	Low
03	Main Hallway – rear	93	Low
04	Hall L	107	Low-moderate
05	Hall M	93	Low
06	M 110	2880	Low
07	Hall K	53	Low
08	Hall L2	280	Low
09	Hall J	53	Low
10	Hall H	253	Low-moderate
11	K 127	67	Low
12	Media Center	427	Low-moderate
13	H 109	53	Low-moderate

Sample #	Location	Total Airborne Spore Count (Spores/m ³)	*Non-Fungal Background Particulate Level
14	Re-test 110 (re-test of Sample 06)	2613	Low-moderate
15	Media Center (re-test of Sample 12)	427	Low-moderate
16	Hall H (re-test of #10)	93	Low
17	Media Center (re-test)	253	Low-moderate
18	Outdoor Air	3867	Low-moderate
19	M 110 (re-test) - closet	93	Low

*The Background Particulate Level refers to non-fungal debris seen in the air sample; such as skin cells, hair, fibers, dust, dirt, etc.

The total fungal spore counts in the areas initially sampled indoors were lower than that found in the outdoor air. Except for the samples collected in M 110, Hall H and the Media Center, the samples were comprised of all common outdoor-type fungi present in low concentration. Therefore, the results suggested a normal indoor fungal ecology in those areas sampled.

The samples collected from M 110 (Sample 06), Hall H (Sample 10) and the Media Center (Sample 12) all had a predominance of *Penicillium/Aspergillus* group spores. Spores in this grouping are commonly considered to be among the water loss fungi. Therefore, the results suggested an altered indoor airborne fungal ecology in the areas sampled. Some species of these fungi are considered allergenic and/or toxicogenic and should be handled with caution. These areas were re-cleaned and final air samples collected showed a ‘normal fungal ecology’.

The particulate in the indoor air samples was in the low to low-moderate range. The particulate that we see in the microscope at the magnification used is usually called ‘course particulate’ and consist of many things and can include the following: dirt, dust, mold, pollen, fiber, hair, skin cells, dust mites and other insects. Fine particulates (to include VOC’s – volatile organic compounds) are not seen with the magnification used for these samples.

Surface Non-viable Tape Lift Sample Results:

Representative surface tape lift samples were collected from suspect mold-contaminated surfaces. Tape lift samples are collected to confirm visual observations. The samples are discussed in the narrative above and detailed in the attached certificates of laboratory analysis. The surface sampling results are summarized below in Table C.

Table C – Surface Sampling Results

Sample #	Location	Spores and Enumeration	Condition
20	Room M110-bottom of round table	Occasional: <i>Penicillium/Aspergillus</i>	1
21	Room M110-bottom rectangular table	Occasional: <i>Penicillium/Aspergillus</i>	1

Sample #	Location	Spores and Enumeration	Condition
22	Room M110 - Sink cabinet	Numerous: <i>Penicillium/Aspergillus</i> Numerous: Hyphal Elements	3
23	H 109 – cabinet back	Numerous: <i>Chaetomium</i> Numerous: Hyphal Elements	3

CONCLUSIONS

Results as reported by LRC apply only to the day of this inspection. LRC cannot and does not warranty that other parts of the structure were completely free or that the structure will remain free in the future from hidden sources of moisture or fungal contamination.

LRC’s visual inspection of the structure was as thorough as possible considering the nature of this investigation. It should be noted that conditions reported in this report were based on the time of the inspection only and circumstances may change following the inspection. Should further issues occur and conditions change it may be necessary to re-evaluate the structure and consider more in-depth testing.

The clearance requirements for this project were as follows:

- The primary clearance criterion was no visible fungal growth. The cleaned areas were inspected for removal of materials and that a thorough cleaning of any remaining surfaces had been completed to remove excess fungal spores, dust and debris.
- Surfaces should be dried to industry standards.
- Representative tape lift samples were collected where deemed necessary for non-viable fungal analysis. Acceptance criterion was fewer than 100 spores, on average, per square inch of material tested. There can be no predominance of fungi commonly considered to be among the water loss fungi (e.g. *Stachybotrys* species, *Chaetomium*, or *Penicillium/Aspergillus* group spores.
- Clearance criteria for the non-viable spore trap air samples were as follows: the total fungal spore count should be lower than that found in the outdoor air. The fungal composition indoors should be similar to that found outdoors with no predominance of water-damage fungi indoors. The caveat to these criteria is if common water-damage fungi are present in the outdoor air samples, it is unreasonable to expect them to be excluded from the indoor sample.

The final visual observations, moisture measurements, and final air/surface sample results reflect that of a normal indoor fungal ecology.

If you have any questions or concerns, please do not hesitate to contact us.

Sincerely,

Handwritten signature of Cathy A. Richmond in cursive script.

Cathy Richmond, B.S.
LRC Indoor Testing & Research

Handwritten signature of Tony Richmond in cursive script.

Tony Richmond, BBA, CAI, WRT
LRC Indoor Testing & Research