April 20, 2016

Clemson University
310 Klugh Avenue
Clemson, South Carolina 29634

Attn: Mr. W. Robert Newberry, IV
E: wnewber@clemson.edu

Re: Limited Mold Investigation Report
Clemson University
Center for Applied Technology – Ansell Laboratory
511 Westinghouse Road
Pendleton, South Carolina
Terracon Project No. 86127158

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted a limited mold investigation in the Ansell Laboratory within the Center for Applied Technology (CAT) building located at 511 Westinghouse Road in Pendleton, South Carolina. It is our understanding there are occupant complaints pertaining to mold. The investigation was performed in general accordance with our IDC with Clemson University.

PROJECT DESCRIPTION

At the request of Clemson University Terracon conducted a limited mold investigation in the laboratory occupied by Ansell, a manufacturer of gloves and protective clothing in the Center for Applied Technology located at 511 Westinghouse Road in Pendleton, South Carolina. The occupants of the laboratory had complaints of mold growth, specifically on portions of the west wall of the lab, which is an exterior wall. Terracon representative Mr. Ben Hestir inspected the laboratory on April 4, 2016 and on April 18, 2016. For simplicity, the main entrance to the building will be referenced as the south side and other portions of the building referenced from that.

It is Terracon's understanding based on conversations with Jim Thompson and Tony Martinez of Ansell that previous repairs were made to the exterior wall (west side of the lab) within the past two years consisting of drywall replacement due to mold growth. This lab is located on the west side of the building just north of a hallway that runs the entire width of the building. The building is metal frame and metal exterior on the east, west and north sides. The main entrance includes a stone and stucco façade.

This investigation was conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the same locale. Terracon did not attempt to identify every potential exposure or hazard present in the subject building. The results, findings, conclusions, and recommendations expressed in this report are based on conditions observed during our investigation. Many factors, such as weather conditions, building occupancy, ventilation patterns, and seasonal variations in fungal/bacterial concentrations or local sources of volatile chemicals, can affect the conditions observed. The information contained in this report should not be relied upon to represent conditions that existed prior to or after this investigation. Terracon does not warrant the services of regulatory agencies, laboratories, or other third parties supplying information that may have been used in the preparation of this report.

INVESTIGATION CRITERIA AND METHODS

Physical Assessment

The physical assessment was conducted to determine whether building materials were impacted by moisture intrusion or condensate formation, and to identify the presence of visible fungal growth. The inspection focused primarily on collecting observational data (i.e., information obtained by physical inspection of the building and interviews with the building management, owners, and occupants). The physical inspection can help to formulate plans for more in-depth investigation. Destructive sampling or testing to inspect interior wall cavity spaces or mechanical enclosures was not within the scope of work for this project.

The physical inspection included:

- an examination of the physical structure and potential indoor and outdoor sources of moisture intrusion;
- the identification of any discoloration or odor that could indicate moisture intrusion, water damage, and/or fungal growth;
- using a moisture meter to detect moisture impacted materials; and,
- an examination of the HVAC system(s) and its components.

Moisture Content in Building Materials

Excess moisture in or condensation on building materials may result in the growth of fungi or bacteria. There are no regulations or standards for moisture content in installed building materials. Moisture content will vary building-to-building and across geography, depending largely on relative humidity and indoor environmental conditions. Terracon applied industry best practices and equipment manufacturer guidelines to determine the moisture content of materials in this facility.

A moisture meter was used to identify suspect water-impacted materials. Building materials have different absorptive and moisture retention properties and will come into equilibrium with environmental moisture (as indicated by relative humidity levels) or become wet by contact with water.

Our investigation was limited to accessible surfaces. No demolition or fixture removal was performed to access interstitial spaces such as mechanical enclosures or wall cavities. A Protimeter® Mini Moisture Meter, Model BLD2000 direct-reading instrument was used to measure the moisture content of the building materials included in this investigation. The moisture meter works via the measurement of electroconductivity through the material being tested via two penetrating probes.

According to Protimeter®, readings above 16% on wood components should generally be considered excess moisture that may indicate moisture intrusion and the early stages of wood-deteriorating organism growth. Wood Moisture Equivalent (%WME) readings on materials other than wood components (e.g. drywall) above 16% WME would also be considered moisture impacted.

Infrared (IR) Camera

The inside surface of the exterior wall of the Ansel Laboratory within the Center for Applied Technology (CAT) building was viewed with a FLIR Model C2 thermal imaging IR camera for evidence of temperature differentials in building materials that might indicate evidence of air leakage or wet materials.

FINDINGS

Physical Assessment

Ansell Laboratory is on the west side of the CAT building. The CAT building was reportedly constructed in the 1980's and contains 30,000 square feet total on a 2.5 acre parcel. The room of concern within the Ansel Laboratory is approximately 1,326 square feet (34 feet by 39 feet). Heating and cooling is supplied through a lab-dedicated HVAC unit with no apparent fresh air source. The laboratory is maintained at approximately 65% relative humidity. According to Ansell lab director Jim Thompson that level of humidity is a standard for textile laboratories in the United States. As a result of the standard high humidity, the lay-in ceiling grid contains water resistant tiles.

The majority of the CAT building structure is steel frame with steel cladding on a concrete slab with a gently sloped roof with gutters. The main entrance includes a stone and stucco façade.

Inside the Ansell Laboratory, mold growth was observed on the inner surface of the west side exterior wall in scattered locations. The west wall has no windows. The majority of the lower portion of the wall is covered by a laboratory bench style fixture. Other areas of the wall that have visible mold were previously obstructed by various pieces of material testing equipment used by Ansell. As you face the west side exterior wall from the interior entrance doors there was mold in the left corner left of the cabinet fixture, just to the right of the cabinet fixture and in the right corner of the room. A rear panel was removed from the cabinet fixture and one area of mold growth was observed behind the far right side of the fixture.

Outside the lab on the west side of the building is a concrete pad for building HVAC equipment. There is a gap of about two feet between the building slab and the concrete pad. The two gutter downspouts in this area were observed and although at least one gutter extension pipe was present to move water away from the building, it was no longer connected to the downspout. The metal siding on the outside of the building appeared to be stained with red clay due to water dripping from the gutters which appear to be full of debris. Also, a condensate drain was observed in the same area adding further to the accumulation of moisture.

Pictures from the investigation are shown in the attached Photo Log.

Moisture Content in Building Materials

Drywall moisture levels measured in and adjacent to the areas of observed mold growth previously described were all below 16% wood moisture equivalent (%WME).

Infrared (IR) Camera

Observations of the lab exterior wall were made with the FLIR IR camera during our second visit to the lab on April 18, 2016. At the time of our images collected with the IR camera, it was approximately 84 degrees outside and 72 degrees inside. The images showed areas in the exterior wall and adjacent ceiling areas that appeared to be missing insulation. The floor/wall junction showed evidence of air leakage as did the ceiling/wall junction. Areas of higher heat transfer within a building are referred to as thermal bridges.

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are provides based on our assessment:

- Due to the requirements of the Ansell Laboratory, relative humidity (RH) in the lab is maintained at a level that is high enough (greater than 60% RH) to support mold growth, especially in areas with a lack of airflow.

- Roof leaks were reported in other areas of the Ansell facility but were not obvious in the laboratory.

- During colder months or evenings, air leakage and or thermal bridging on the outside wall could result in cold air being pulled in or cooler interior building materials from thermal bridging. These cold areas can cause wall components (drywall, drywall screws) to reach the dew point temperature resulting in localized condensation and subsequent mold growth. For example, if the room is maintained at 65% relative humidity, at a temperature of 68°F the dew point would be 55°F. At a temperature of 75°F the dew point would be 62°F. Furthermore, IR thermography indicated potential missing insulation in the exterior wall in one location. The wall system should be reviewed for air leakage, thermal bridging, and missing insulation to prevent the exterior wall from reaching dew points. Additional insulation on the exterior wall and/or insulation to reduce thermal bridging may be necessary for the needs of the room.

- Accumulations of water outside of the building due to poor water management periodically cause the building slab to be wetted outside of the Ansell Laboratory space leading to additional moisture intrusion in the areas of air leakage potentially contributing to additional condensation and surficial mold growth. Gutters should be cleaned and extensions added to all building gutters to channel water away from the building slab.

- Drywall moisture levels measured in and adjacent to the areas of observed mold growth previously described were all below 16% wood moisture equivalent (%WME). Mold impacted drywall on the west wall should be cleaned with a standard disinfecting cleaner as this appears to be surficial mold growth.

- Materials should not be placed directly against the west exterior wall until air leakage, thermal bridging, and/or missing insulation has been corrected. Lack of airflow could contribute to additional surficial mold growth in areas maintained at 65% relative humidity.

- The scope of this investigation did not include identifying or sampling for ACM. However, the drywall that was impacted by mold growth should be sampled for asbestos by a licensed asbestos inspector before being disturbed/renovated/repaired. If the materials involved in the renovation contain asbestos they must be removed prior to any disturbance that could create an airborne asbestos hazard for workers or building occupants.

Terracon appreciates the opportunity to provide this service to Clemson University. If you have any questions regarding this limited mold investigation report, please contact the undersigned at 864-292-2901.

Sincerely,
Terracon Consultants, Inc.



Benjamin Hestir, P.E.
Project Industrial Hygienist



Jeffrey Gurrie
Senior Industrial Hygienist

Attachments: Photographs

Photographs



Photo #1 Ansell Laboratory – Clemson CAT Building



Photo #2 Looking towards the west (exterior) wall



Photo #3 Lab cabinetry along west wall



Photo #4 Apparent mold growth – left side of cabinetry



Photo #5 Apparent mold growth – left side of cabinetry



Photo #6 Apparent mold growth – right side of cabinetry



Photo #7 North side of lab room



Photo #8 Mold growth on exterior wall in northwest corner of room



Photo #9 Closer view of mold growth in northwest corner



Photo #10 View of gap between the building slab and the HVAC pad – west side looking north



Photo #11 West side exterior – gutter extension no longer attached



Photo #12 Typical temperature and humidity in the Ansell Lab

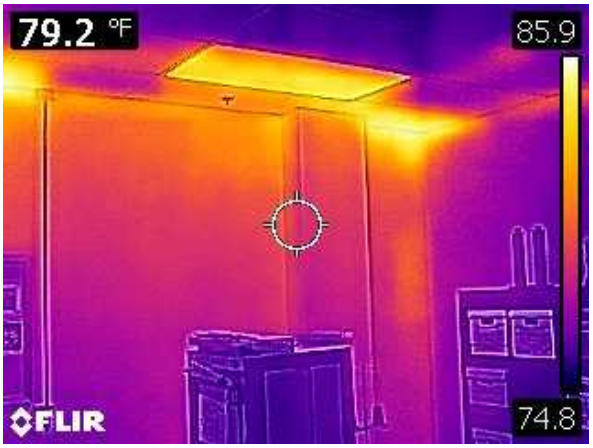


Photo #13 IR image of NW corner of Ansell Lab showing thermal bridge

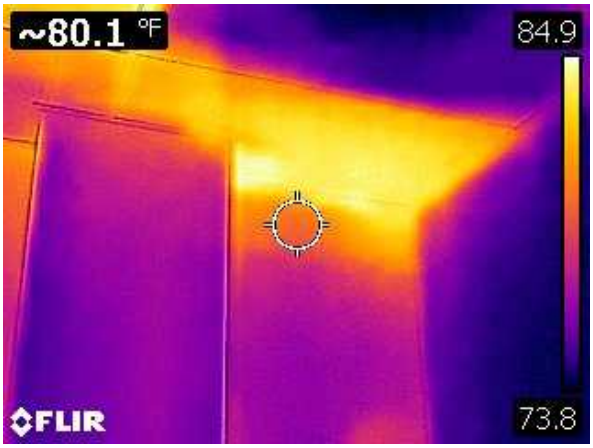


Photo #14 IR image of NW corner of Ansell Lab closer in.

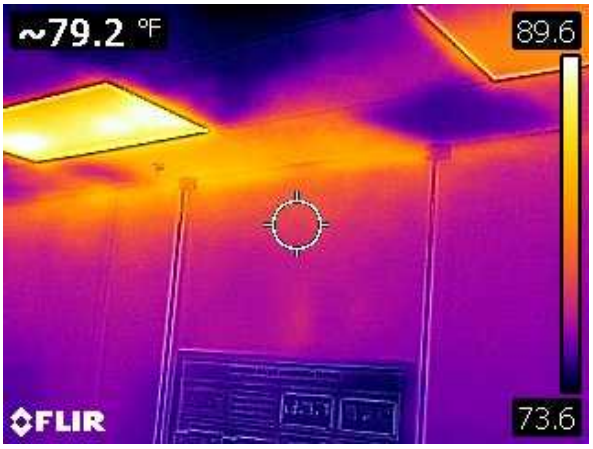


Photo #15 IR image of west (exterior) wall in Ansell lab showing apparent gaps in insulation