AMBASSADOR
CONSTRUCTION CONSULTANTS, INC.

To:

Re: Mold and water dripping in attic

From: Marko E. Vovk
Forensic Moisture Investigator
Ambassador Construction Consultants Inc.

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Lakewood, Ohio 44107
Civil Engineer / ASHI Certified Professional Home Inspector / 203K Certified / State Licensed Radon Inspector / State Licensed Lead Assessor / State Licensed Termite Inspector / State Licensed Termite inspector / Certified Indoor Environmentalist / Certified Air Balancer / Structural Inspector / Over 7000 Home Inspections Performed / Over 750 Environmental Inspections performed / Over 1000 Microbial or other samples taken.
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Clevelandmold@AOL.Com
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Date: 1-28-04 Cold Snow Cover / 24.3 F / 35.9 RH / Dew point 30.0
Inspection time 12:30 PM – 2:30 PM

Dear

On the afternoon of 1/28/04, you employed Marko E. Vovk from Ambassador Construction Consultants Inc. to visually perform a non-destructive, partial, and visual inspection of the XXXXXXXXXX Sheffield Lake property. The following are the opinions of the inspection that transpired on 1/28/04.

Based on my education, training, and experience, there were several observations and conclusions made about the above referenced property.

Facts in issue:

- You lived in this dwelling for about 30 years.
- On 3/29/2001, you had a mold mitigation company perform work in the attic.
- In spring 2001, you added some soffit vents.
- In January, when putting Christmas items away, you noticed that water was dripping in the attic. You also noticed that water was soaking the insulation above the bathroom.

The following are field data from temperature, moisture, and humidity mapping:

Moisture and humidity mapping results

The entire home was mapped for room temperature, room humidity, surface temperatures, and moisture content. Approximately 150 different readings were taken and documented on field notes. Only several of the 150 readings are documented on this diagnostics report. The sling psychrometer[1] was used for baseline testing results and the digital hygrometer[2] was used for the data collection. All surface moisture mapping was conducted using the Tramex moisture-testing gauge and an infrared laser. All values are represented in mathematical terms to determine the potential cause of fungal development.

Nomenclature or abbreviations for all below field data

T=temperature Fahrenheit
ST= Surface temperature buy infrared surface laser thermo gauge
N=north wall, S=south wall, E=east wall, W=west wall, C=ceiling temperature,
F=floor temperature DP=dew point, I=inner wall (inner walls tend to be warmer)
EX=exterior exposed wall (exterior walls tend to be cooler)
M=mold on surface that is being tested for surface temperature

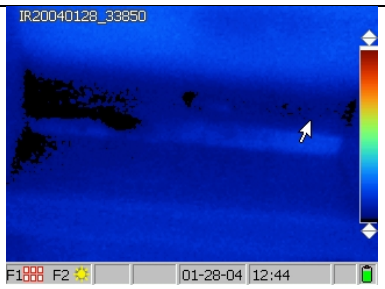
1. First set of readings were taken at 12:30PM at normal house conditions
2. Second set of reading were taken at 2:00PM after the heat was turned up and after the patio door was, open and after 5 adults were walking around home.

Location	Room T	Humidity%	Dew Point	Re-test	Room T	Humidity%	Dew Point	
Family	73.4	33.2	43.8	After 1 1/2 hours	62.4	52.9	44.8	
Liv/Din	74.4	33.9	43.3		66.6	46.7	45.8	
Bed 2	72.4	34.9	43.2		69.8	40.8	45.1	
Bed 3	71.3	38.5	44.3		69.8	46.2	48.2	
Bath 2	70.8	38.8	44.7					
BED 1	70.9	38.9	44.6		69.1	*44.6*	46.7	
BATH 1	71.8	39.5	46.5					
LAUNDRY	74.5	38.2	48.4					
KITCHEN	76	35.0	46.3					
PATIO	66.3	43.1	43.3		66.2	42.3	42.0	
ATTIC	NA	NA	NA		48.3	54.3	30.6	

Most equipment used for this evaluation is calibrated and with NIST Certifications. For numerical purposes and a mathematical analogy, we plotted the wet attic insulation temperatures in the attic above the bathroom to determine if the environment in the home was desirable for fungal amplification.

Diagnostic evaluation of why the insulation.

[1] This baseline test does not need calibration. All gauges used are first compare to the sling results. If equipment is within 3 %, it is used data gathering,
[2] VelociCalc with NIST Cert.



Infrared image of cold and wet area in attic

Surface temperature below attic is 72.2F.

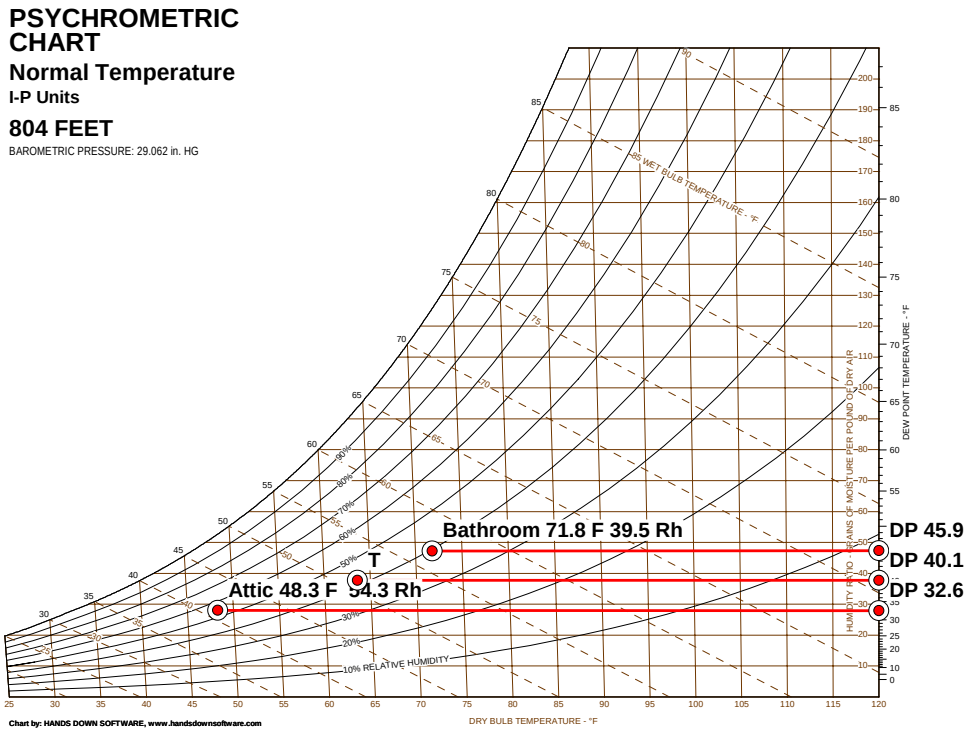
Wood moisture content in attic above bathroom is 20%.

Temperature below first layer of insulation was 63.6F.

Temperature on top of the first layer of insulation was 48.2F.

Temperature of insulation at the top on the second layer of insulation was 38.4F.

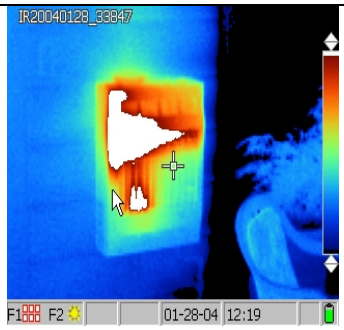
Wet inusulation math above bathroom



The bathroom below this wet insulation area had indoor air conditions initially at 71.8F room temperature and 39.5 relative humidify. The actual dew point was found to be from the above chart to be 45.9F. We also plotted the attic conditions and

found the dew point to be 32.6 F This means that that moisture is condensing somewhere between these two dew points. We measured the temperature of the different layers of insulation using an infrared device. The temperature was found to be in this range. This is why the insulation is wet between the first and second layers of insulation above the bathroom. It was inevitable that water accumulated above this bathroom. You should not use two layers of batten insulation because moisture will be trapped. It is a double vapor barrier and moisture will be trapped. Sometimes, if you do not have this vapor barrier moisture can move freely through vapor diffusion and exist. However, in this home, moisture does not completely exit. It stops at the attic sheathing and forms another dew point. All or most attic sheathing was found to be below the calculated 32.6 F dew point. Attic surface temperatures were found to be 31, 36.2, 30.6, and 31.6. This condensation is causing desirable conditions from microbial amplification.

The following images are the present conditions that exist with this dwelling.



The patio has a ventless heater. The by-product of this is H20 and vapor. This unit continually produces humidity when on. The room is used for plants and smoking. Everytime the patio door is opened grains of moisture escape into the dwelling.

Dew point is forming on the glass in the patio enclosure that has a ventless heater and plants.

The back bedroom on the south and east corner is the coldest room. The forced air duct located under the slab produces virtually no heat. A problem exists with the sub surface ducts.

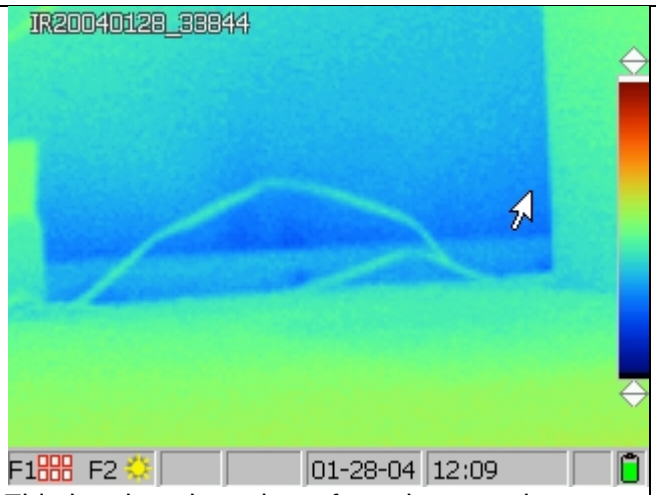
Diagnostics equipment should the humidity showed that the register was not warm and the home heating system was not properly balanced.

The home humidity was increased after the heating system was energized for one hour. The humidity rose approximately seven percent. This was due to the patio door being opened, moisture from five adults walking around in the small 1200 square foot home, attic access opened, and plants. It was also due from moisture being pulled from the soil from the sub slab ducts.

The sub slab duct system was not accessible. It is probable that some moisture in this dwelling has contributed to the breeches in the sub slab ductwork. A camera study would assist the conclusion. If moisture cannot be controlled in this home, abandoning and relocating the ducts may be necessary.

This home had over 20 plants. Each plant must be watered. Most of the water eventually evaporates and contributes to the high humidity. I would estimate the all the plants use about ¾ gallon of water per day. In the winter when cooler air holds less water, it is significant.

Two people live in this home. People will release moisture as well. Depending on how long people spend in the home will depend on how much moisture is released. Some resource state, that one adult can produce about one gallon of water per 24-hour period.



This is a location where fungal reservoirs develop. The adjacent image in the same location with a normal camera. This infrared image shows darker blue colors that portray a cold spot in this home. The temperature at this particular lactation is approximately six degrees colder than most exterior wall surfaces. This is why fungal reservoirs amplify here first.

We measured all first floor wall temperatures. The average wall temperature for internal walls was 73F. The average exterior wall temperature of all exterior walls was 66F. If you notice the cold spot from the digital image and infrared image, the temperature is only 60F. It was at this location that fungal reservoirs developed in the past. The east corner was also a location that fungal reservoirs developed. This in the southeast cold room that also has a poor under-slab duct system. This room reaches dew points much quicker and is more susceptible to fungal amplification. Fungal reservoirs also develop in the attic location above this area due to it being colder.

Fungal reservoirs are the result of high indoor humidity. Moisture conditions in this home must be diminished to cease further fungal implication.

Attic temperatures are below their respected dew points. At the time of inspection, the cobra vent was dripping water to the attic floor.

Executive Summary

This home has moisture conditions that caused fungal reservoirs to amplify. These conditions are occurring on exterior walls, attic sheathing, and interstitial cavities. These conditions are causing damage to the structure and contributing to indoor air pollution.

It is our professional opinion with reasonable certainty, that,

1. **The ventless space heater in the patio enclosure is the major contributor to the high indoor humidity in this home.**
2. **The under slab duct system is sucking some moisture from the ground below this home.**
3. **The occupants of this home produce a significant amount of moisture from daily cooking, normal living conditions, human body moisture release, watering of many plants, evaporation of spilled bird water and other conditions.**

Solutions: (This would be the order I would choose)

1. **Change ventless heating unit to vented heating unit.**
2. **Add an indoor dehumidifier to help remove excessive water grains from the air when needed.**
3. **Abandoned the under slab ducts and relocate.**
4. **Diminish the amounts of plants.**
5. **Change life style to diminish excessive indoor moisture accumulation.**
6. **Fix double vapor barrier problems.**

DISCLAIMER

This inspection should be considered partial, time-limited, non-destructive, and strictly opinion oriented. We can at some future date, generate a more extensive report with other observed conditions from our field notes, digital photographs, and additional inspections. We can at some future date conduct a full building inspection of all building components such as attic, roof, plumbing, interiors, walls, beams, headers, stairs, exterior, grounds, garage, stairs, heating, cooling, appliances, radon gas, mold, pest, or any other home inspection related field constituent. We cannot be held liable for misunderstanding or the omission of any item pertaining to the above said structure. We encourage that you obtain second opinions as we do all our clients for all our inspections. This report is not intended for third parties and is not transferable. Third parties should obtain their own reports from their own inspectors. This report is not intended to be; a design structural repair, a repair estimate, an environmental inspection, a load study, a determination of footing size or footing depth, a determination of possible future conditions, a determination of future slab settlement, a code inspection, a prediction additional cracking, a geotechnical soil investigation, and engineering calculation, a predication of settlement, a run-off study, and underground sewer exploration, sub-slab seepage exploration, a HVAC design, a bacterial or fungal investigation, a camera study, or any other technically exhaustive inspection that may require a more precise investigation. Furthermore, this inspection only includes the visual aspects of the heating system. You should obtain at least three bids per work type. The repair contractors should provide you with the full scope of work and necessary QA/QC. The entire report does not include underground storm and sanitary piping, conditions, and connections. Dye testing and sewer camera studies are recommended if more detail is needed. This investigation. Was strictly visual and limited to HVAC ductwork. No microbial samples were taken.

If you have any questions pertaining to this matter, please feel free to contact me 431-TEST or 431-HOME.

Thank you,

Marko E. Vovk

Fee for the inspection and report was $295 and was paid in full at the time of inspection. Additional testing, reporting, non-destruction testing, thermo imaging, expert witness testimony, depositions will all require additional fees and to be paid prior to any scheduling. Expert witness and depositions are billed at ½-day rates of $450. Only several images out 95 were used for this report. Images can be purchased for $2 each and $150 storage fee. The digital lots will not be split up and must be purchased in its entirety. This report is to be considered expert and not factual. Additional reports can be purchased for $25 each. The images are the properly of Marko E. Vovk and cannot be duplicated without his permission.
Other services: estimate of damage report $300, thermo imaging $300, \mold testing depends on amount of testing.