



To:

Re: Microbial contamination due to failed building components.
Excessive humidity causing dew points.
Defective HVAC, ductwork, ventilation and other components.

From: Marko E. Vovk
Forensic Moisture Investigator
Ambassador Construction Consultants Inc.
1501 Spring Garden
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.

216-431- TEST (8378) Voice mail and downtown office

216-924-TEST (8378) Car

216-421-0790 Home fax

Clevelandmold@AOL.Com

www.houseinvestigations.com

Date: 1-23-04 Friday
10-30 AM- 12:30 PM
Cold 10 F, Sunny

Dear

On the morning of 1-23-04, you employed Marko E. Vovk from Ambassador Construction Consultants Inc. to visually perform a non-destructive, partial, and visual inspection of the ductwork that existed below the slab-on-grade system. The following are the opinions of the inspection that transpired on 1-23-04.

Based on my education, training, and experience, I have made the following observations and conclusions about the above referenced property.

Facts in issue:

- You moved into this condominium unit in 1997.
- You always had moisture condensation on the windows. This condition usually occurred in the winter when the furnace was turned on.
- You could never paint the windows because in the wintertime the wood was always wet.

- You informed me that the association recently repaired the roof and repaired a defective exterior drain tile. They informed you that this exterior drain tile was found to be defected from its initial construction. Allegedly, this system was installed at a high elevation and water was able to enter the HVAC under slab. The repair crew performed excavation and work on this project from 1-16-04 to 1-21-04.
- You called a mold remediation company and a forensic moisture investigator for second opinions.

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. The sling psychrometer¹ was used for baseline testing results and the digital hygrometer² 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 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

WN=window wood frame

H=heat turned up to 76 F for 15 minutes and retest rooms.

*All other tests done prior to energizing the furnace. This would be considered the normal house conditions.

Location	Room T	Humidity%	Dew Point	ST	ST	ST	ST	ST
Exterior south side	13.7	65.7	5.2	na	na	na	na	na
Attic .4near access	49.5 to 20 eaves	36.4	24.5	29S	26E	22E	na	na
Living room	71 76.4H	34.7 31.1H	41.7 43.6H	63.2C	68.2F	66.6I	66.8EX	na
Spare bedroom	71 76.1H	36.1 31.6H	42.7 43.7H	66.6C	66.6F	67.1I	60EX	36 ON WN
Mast.	70.6	37.3	43.3	69.4C	72.2F	72.2I	66.0EX	52

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.

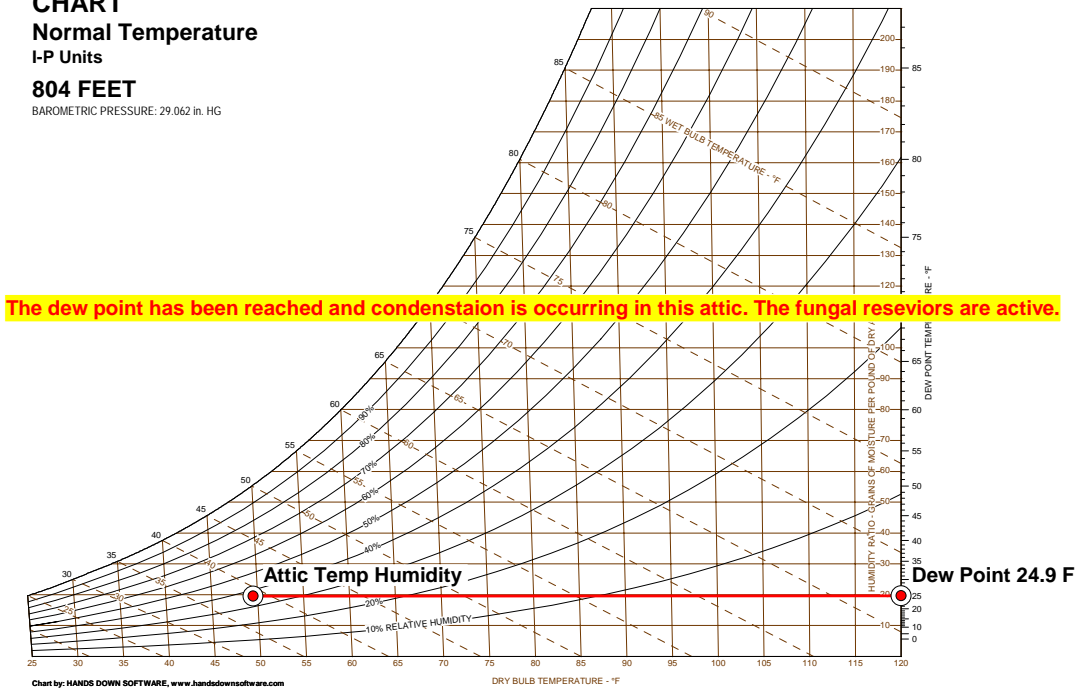
bedroom	75.6H	33.6H	44.5H					ON WN
Mast. bath	71.0 76.0H	38.3 33.6	44.9 45.4H	na	na	na	na	na
Main bath	71.3 76.1H	38.3 32.7H	44.4 45.4H	na	na	na	na	na
Laundry	71.6 76.5H	35.5 31.9H	43.4 43.7H	na	na	na	na	na
Kitchen	71.7 76.6	34.4 31.3	42.2 43.7	na	na	na	na	na
Average house humidity under normal 71 F conditions 42.2 to 44.9	Average house humidity after heat up to 76 F 43.7 to 45.4	Average humidity after 2 hours at end of this inspection went up to 72.4F 37.0RH 43.4DP	Moisture probe tests on window wood 19% living room	Moisture probe tests on window wood 15-17 mast bedroom	Moisture probe test on window wood in kitchen 11%	Corner Room mold area temps 50. 46.2 49. 50.8 46.2 52. most on south	Corner Room no mold area temps 62.2 66. 67. all on north	
Living room register test	Temp. from register F	Humidity from register %	na	na	na	na	na	na
Fan on	70.6	37.4	na	na	na	na	na	na
Off after 10 minutes	68.7	40.7	na	na	na	na	na	na
On	82.2	25.5	na	na	na	na	na	na
Fan on again	74.3	33.9	na	na	na	na	na	na

Most equipment used for this evaluation is calibrated and with NIST Certifications.

For numerical purposes and a mathematical analogy, we plotted the coldest surface to determine if the environment in the home was desirable for fungal amplification. This graph depicts the attic conditions at the time of this inspection.

Attic temperatures. North side has 21.7 surface temperature near soffit.

PSYCHROMETRIC CHART
Normal Temperature
I-P Units
804 FEET
BAROMETRIC PRESSURE: 29.062 in. HG



The above mathematical representations depicts that during our inspection, the dew point³ for the above condition was 24.9 F. In conclusion, the entire attic of this home has humidity levels that are causing the dew point to occur. Dew points and moisture are necessary for microbial amplification.

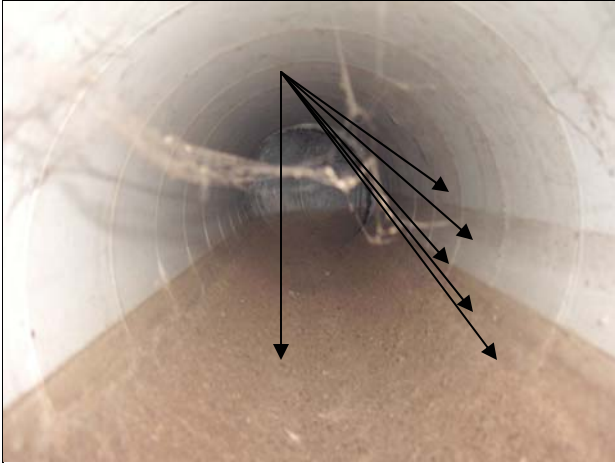
Condensation is occurring at all cold surfaces that are below their respected due point. Areas include, but not limited to, are windows, window frames, attic sheathing, cold metal surfaces, walls, ceilings, corners, and most probably interstitial cavities. A high probability exists that on the south side of the entire dwelling has hidden mold or moisture. Destructive or non-destructive testing would be needed to determine if moisture or fungal reservoirs exist within the interstitial spaces (inside wall cavities). Air testing walls or thermo graphing with infrared imaging⁴ can be done at some future date to determine how much hidden moisture exists in the walls. Our firm can perform these tests in future dates if needed.

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

³ Dp = Dew Point Temperature

The temperature of moist air saturated at the same pressure and humidity ratio. Alternatively, more simply the temperature at which water vapor will begin to condense from a sample of air.

⁴ Ambassador Construction Consultants Inc. owns an infrared digital ther- imager that can scan walls for hidden moisture. Fees are \$150 per hour with a two-hour minimum. Most infrared imaging can be done in less than two hours. Images duplication to CD is included. Expert report generation would incur some additional charges.



The ducts under the slab have been flooded many times. This can be seen from all the flood marks. For mud to get this thick at the bottom of the duct, flooding must have occurred hundreds of times. Previous owners must have known about this condition. This condition has been occurring for many years and even decades. The exterior drain tile system is defective and allowing sub-slab moisture migration. Due to this condition, damp rise is also suspected.⁵ (5 Damp rise is moisture movement upward through the concrete slab)



This duct is deteriorated and cannot be cleaned. The least expensive solution may be to fill all ductwork with concrete and install all new ductwork in the ceiling. A new furnace would be needed to perform this task. A feasibility study would be required prior to making duct repairs. Water proofing the entire home and installing exterior sump pumps may also be needed to de-water the entire site to minimize damp rise potential.



The HVAC installer and builder did not properly compact the soil during the initial construction. The heat ducts settled and large voids exist about the heating ductwork. This is allowing for dust, sand, and moisture to migrate into the dwelling.



In the duct in the kitchen, I was able to push a tape measure into this void almost 12 foot. The entire dwelling unit is susceptible to moisture, sand, silt, dust, radon fungal, biological contamination. This condition cannot be repaired without slab removal. Ducts under slab should be sealed not to allow contaminants to enter.



Testing for temperature and humidity was done to ductwork. From the testing results, it was determined the high interior condominium humidity is and has been coming from the subsurface ducts.



Readings for most indoor humidity, temperature, and dew point was done using a VelociCalc Plus. All readings are documented in the data chart.



The corners of the home are significantly colder than most other surfaces. In most cases, the corner temperatures were 30 degrees colder. Moisture is condensing at most of these locations allowing for fungal amplification. This is a sign of poor initial construction.



This is a test of an inside wall. The temperature is 68 F. The wall temperature differentials are significant in this home. These area all signs of poor construction, poor insulation, and poor ventilation.



Attic temperature is below the dew point and causing condensation and frost.



Fungal reservoirs have developed on the attic sheathing because of water in the duct system.



Window wood temperature is almost at freezing levels. This is due to poor HVAC balancing and possibly poor wall insulation/



Condensation has damaged most windows on the south side. The average moisture levels were 17% -20%. These levels are excessive and will induce fungal reservoirs and wood decay.



The insulation installation was defective and not allowing for proper attic ventilation.



Poor attic ventilation and improper installation are causing excessive ice dams.



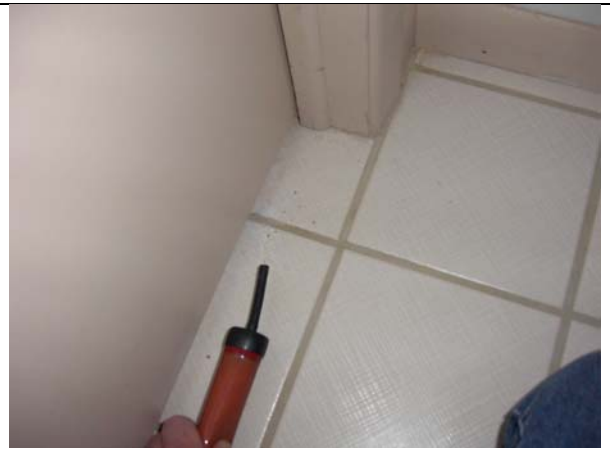
The painter is also responsible for the attic condensation and ice damming. This painter painted over the continuous soffit vents clogging them restricting necessary airflow.



The condominium association is allowing trees to grow too close to the condominium units. Tree roots could contribute to falling drain tiles.



This condominium unit only has two cold air returns. Many rooms have no cold air return. This was determined using smoke tubes.



The HVAC is not properly balanced. Some rooms are pressurized and other rooms are depressurized. Depressurized rooms and cause undesirable interstitial conditions.



Fungal reservoirs on most windows and under window units. Using a thermo imager can determine cold cavities with potential defects.



Cathedral locations were not accessible at the inspection time. Conditions at these areas are unknown.



Fungal reservoirs on ceiling at cold areas



This condition is directly above a fungal reservoir that existed in the adjacent image. Insulation is missing and causing a cold ceiling condition.

Executive Summary

This home has moisture conditions that caused fungal reservoirs to amplify. Active fungal reservoirs are being caused by an on-going moisture event from flooded ducts. Fungal reservoirs are also being caused by indoor air building science conditions, from poor initial construction, and past poor maintenance. The entire unit is contaminated and has noticeable MVOC'S (microbial volatile organic compounds) odors.

It is our professional opinion with reasonable certainty, that,

1. The HVAC system is poorly installed, poorly balanced, and is the major contributor to the high indoor humidity conditions.
2. The heating system ductwork only has two runs that originate from the north center and travel clockwise and counterclockwise terminating on the south center that cause the south side of the condominium to have colder outer walls and windows that condense.
3. The contractors that worked on this unit lacked quality control and implemented poor construction practice resulting in water intrusion, ice dams, condensation, cold rooms, cold walls, cold ceiling, and other conditions.
4. The painter choked off the continuous soffit vents that is causing ice damming and poor attic ventilation, (the painter did this to other units as well and should be responsible).
5. The condominium association admitted fault by recently rerouting exterior drainage pipes that may or many not be effective.
6. The insurance carrier should have inspected this unit before insuring.
7. The insurance carrier would have discovered these defects if it would have inspected the unit prior to insuring.
8. The insurance carrier would have not insured this unit if they knew of these defects.

9. The insurance carrier will ultimately use the pre-existing problem excuse.
10. The condominium association does not implement building science maintenance,
11. The previous owners must have known about this problem and should have disclosed.
12. The owner of this unit probably would have not purchased this unit if problems were disclosed, if insurance carrier conducted an inspection prior to insuring, if other inspection revealed these defects.
13. The metal registers and carpet are ruined from rust, moisture, and dust.
14. The walls have the potential to contain interstitial moisture or fungi.
15. The walls and windows are ruined from ongoing condensation.
16. The unit has active fungal reservoirs and indoor air is completely contaminated with fungal spores.
17. Repairing this unit and restoring this unit to the original will result huge repair bills.

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 155 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 property 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.