



To: XXXXXXXXXXXXXXXX

Job: XXXXXXXXXXXXXXXX

From: Marko E. Vovk
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Inspector / Structural Inspector / Certified Indoor Environmentalist / Certified Air
Balancer / Over 7500 Building and Home Inspections Performed / Over 750
Environmental Inspections performed / Over 3000 Microbial Mold or particulate samples
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Date: 1-18-05

RE: Forensic Moisture Evaluation for Fungal Reservoirs.
1. Building Science Investigation
2. Microbial Investigation without Sampling
3. Indoor Air Quality
4. Construction installations

Dear XXXXXXXXXXXXX,

On the afternoon of 1-18-05 , you employed Civil Engineer and Certified Indoor Environmentalist (CIE) Marko E. Vovk from Ambassador Construction Consultants Inc. to visually perform a non-destructive, partial, and visual inspection of the property located at xxxX

The purpose of this inspection was to determine if visual fungal reservoirs¹ could be seen or had conditions for amplification². Secondly, to determine what is causing the fungal reservoirs and if dwelling conditions exist that will permit further amplification. Finally, to determine the condition of the roofing system, concrete driveway pavement and ongoing ice dam formation.

¹ Fungal Reservoirs means visual mold.

² Amplification means growing mold.

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

Building Science Section

The entire home was mapped for room temperature, room humidity, surface temperatures, dew point, and moisture content. The sling psychrometer was used for baseline testing results and the digital hygrometer 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 potential cause of fungal development. We only plotted the attic location. This location had the coldest surface temperature.

The following are field data from moisture and humidity mapping. These are the actual authentic field notes from mapping to decrease duplicating error.

LOCATION	TEMP	RH	DEW POINT	ST N	ST W	ST S	ST E	ST CEIL	ST FL	ST M
Basement	61.9	25.7	26.1	61.0	53.6	57.2	57.4	64.6	60.4	
Dining	68.9	25.1	29.6	69.8	62.6	59.2	58.8	65.6	61.8	
Living	69.6	22.6	30.2	65.0	70.4	64.0	63.0	66.2	68.8	
Bed SW	68.6	27.3	34.3	67.6	68.8	52.8	72.8	79.2	69.8	
Attic	53.7	38.0	28.1	39.4	34.2	37.0	39.6			
Bed SE	61.2	30.6	32.6	66.8	68.6	46.2	54.6	65.8	59.6	
Outside	25.7	38.2	4.1							

Below we plotted the coldest obtained temperatures. This was done to see the mathematical representation of the conditions of the home.

Report Date: Thursday, January 27, 2005
 Project Information: ATTIC CONDITION 53.7 F Temperature and 38.0 % Relative Humidity

Altitude: 804 (Feet)
 Barometric Pressure: 29.062 (in.Hg)
 Atmospheric Pressure: 14.274 (psia)

1. ATTIC

Air Flow (Standard) (cfm)	Dry Bulb (°F)	Wet Bulb (°F)	Relative Humidity (%)	Humidity Ratio (gr/lb)	Specific Volume (cu.ft./lb)	Enthalpy (Btu/lb)	Dew Point (°F)	Density (lb/cu.ft.)	Vapor Pressure (in.Hg)	Absolute Humidity (gr/cu.ft.)
1,000	53.700	42.544	38.0	23.9	13.393	16.593	29.1020	0.0749	0.1579	1.784

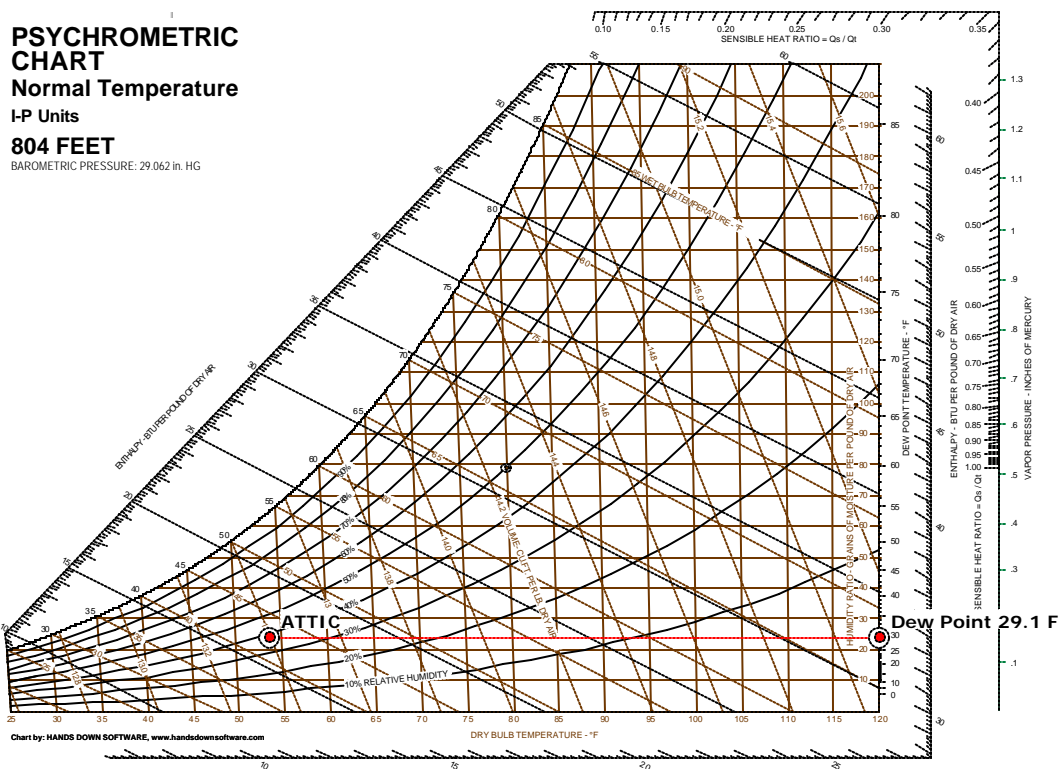
2. Dew Point 29.1 F

Air Flow (Standard) (cfm)	Dry Bulb (°F)	Wet Bulb (°F)	Relative Humidity (%)	Humidity Ratio (gr/lb)	Specific Volume (cu.ft./lb)	Enthalpy (Btu/lb)	Dew Point (°F)	Density (lb/cu.ft.)	Vapor Pressure (in.Hg)	Absolute Humidity (gr/cu.ft.)
1,000	120.000	68.177	4.6	23.9	15.122	32.605	29.1000	0.0664	0.1579	1.579

Process: Connect States

Start Point Name	Total Energy (Btu/hr)	Sensible Energy (Btu/hr)	Latent Energy (Btu/hr)	Moisture Difference (lb/hr)	Sensible Heat Ratio	Enthalpy/Humidity Ratio (Btu/lb / lb/lb)
ATTIC	72,054	72,056	-2	0.0	1.000	N/A

ATTIC CONDITION 53.7 F Temperature and 38.0 % Relative Humidity



The above mathematical representation depicts that during our inspection, the dew point³ for the above attic condition was 29.1 F. The attic surface temperatures are not below this dew point. The conclusion that can be drawn from these calculations is the present ice dams and attic mold conditions **are not** caused by the occupants living conditions, but rather from the building anatomy poor roof ventilation, and a poor roofing installation.

The following are several digital images taken of this dwelling. These images show ongoing conditions, past fungal reservoirs, and other building science⁴ conditions, roofing installation and ice dams. Below these images is an explanation of the condition.

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 Building science for this report means moisture findings caused by building materials, construction methods, and moisture addition.



Ice dams are caused by poor ventilation. Damage now exists to porch, shingles, gutters, trim, and other siding material.



Ice dams have caused significant damage to the entire front porch. Stains still exist from the melting process.



Front porch is damaged by water, mold, and ice.



Ice dams have caused major damage to the living room ceiling. Infrared shows moisture within the older plaster.



Ice dams have caused major damage to the living room ceiling. Ice dams have caused the living room ceiling to fail. This is the same infrared image the is shown adjacent.



The last roofer changed the homes roofing system. The original roof was made of tile. The new roof is now shingle. The roofer should know if you change the roof anatomy, you must take all variables into consideration. This roof does not have enough ventilation for the newer asphalt shingles.



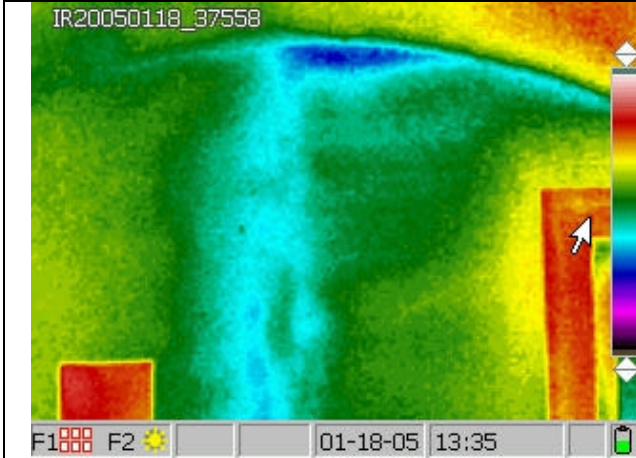
Lack of roofing ventilation does not allow for the proper attic ventilation. This condition has caused fungal reservoirs to develop and amplify. The old removed tile roof had more ventilation due to the large gaps between tile members and roof sheathing.



The roofing installation is substandard. Flashing installation is substandard.



Leaks have now caused damage to interior plaster and drop ceilings.



Ice dams are now melting and causing interstitial moisture. The blue color in this infrared image is water trapped inside of the exterior wall from melting ice.



This image looks good. But if you look at the adjacent infrared image, you will see that water is running down the inside of this wall from the melting exterior ice dam.



The moisture meter shows that excessive moisture exists within this wall. All walls that were wet should be removed and replaced.






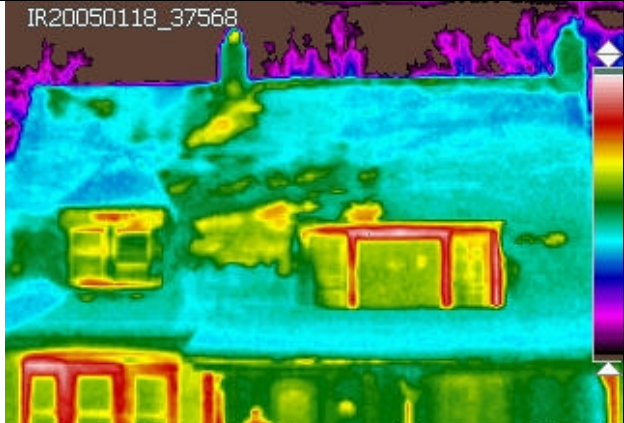
The home still has many ice dams. The roofer contractor changed the anatomy of this home. This contractor should have incorporated proper ventilation to this roofing system.



The front porch has foundation structural



The few attic vents the contractor did install,

problems.	were not proper.
	
<p>The new roofing membrane has some surface damaged from foot traffic and possible roofing installation methods</p>	<p>Other homes in your area do not have ice dams. This is a home one block away.</p>
	
<p>The ice dam can be seen hiding under the roof snow on the north side. The purple color is ice.</p>	<p>Uneven snowmelt occurs due to this buildings anatomy. This condition is allowing for excessive ice dams to form. The roofer is a professional and should have warned you of these potential occurrences.</p>

APP (Aggressive Particle Profiling.)
Air-borne particulate
Particle Contamination Section

Scope and Purpose:

1. To sample with a laser particle counter the air in various locations of the dwelling;
2. To determine if there is contamination by airborne particulate;
3. To qualify the size and quantify the amounts of the contamination.

Laser particle count examination is critical to indoor air quality investigations. A particle investigation is designed to quantify air contamination by particle size. Particle counting effectively analyzes the effectiveness of the air handling filtration systems. The particle counter used for this project was an HHPC-6 ARTI Particle

Counter. The device has six channels to read various size particles in microns. The channel sizes are .3, .5, .7, 1.0, 2.0, and 5.0. There is a variable pump rate, and was set to pump 2.83 liters per minute. This is equal to a volume 1/10th of a cubic foot.

The device quantifies particle contamination and allows the indoor air environmentalist to make determinations based on the results.

There is a distinct coordination between respiratory penetration and particle size. The symptoms and health affects of particulate inhalations vary from respiratory irritation, allergies, infections, and cancer. In general, respired particles affect us in the following ways:

- They can impair respiratory functions.
- Particle may cause a chemical or mechanical irritation of tissues. Nerve endings at the deposition site can also be damaged.
- They can aggravate existing respiratory or cardiovascular disease. They can impact our immune system and cause more morphological changes in lung tissue.

Health exposure to contaminate falls into two categories. Indoor air quality exposure (which is non-occupational) and occupational. Wallace (1991), and Wilkins (1993), showed that inhaling particles are associated with increased prevalence of "sick building syndrome." The symptoms are mucus irritation, difficulty in concentration, and distraction of occupancy by annoyance odors. Particulate contamination breaks down as follows in the human body:

- >10, um may be respirable but do not penetrate
- 7 to 11 um particles, penetrate nasal passages
- 4.7 to 7 um particles penetrate the pharynx
- 3.3 to 4.7 um particles penetrate trachea and primary bronchi
- 2.1 to 3.3 um particles penetrate secondary bronchi
- 1.1 to 2.1 um particles penetrate terminal brochi
- 0.65 to 1.1 um particles penetrate bronchioli
- 0.43 to 0.65 um particles penetrate alveoli

A study of high-rise office buildings (Armstrong, Sherertz, and Llewellyn 1989) showed that high levels of particulate resulted in sinus and upper respiratory congestion and headaches. In 1993, Gravessen, Ipsen and Skov found that macromolecular organic dust correlated significantly with the number of occupant's complaints consisting of:

- Extreme fatigue
- Itching eyes
- Nasal congestion
- Headache
- Sore and irritated throats

Two categories of particles are of particular concern: microbial and combustion by-product. Microbial particulate causes irritation, allergenic illness, infectious illness, and has toxic effects on the body. Combustion by-products (that is particulate from vehicle exhaust, tobacco smoke, heating appliances, office machinery, and cooking appliances) creates polycyclic aromatic hydrocarbons or PAH's.

Particulate testing is particularly critical to ASHRAE Standard 52.2-1999, titled "Method of Testing General Ventilation Air-Cleaning Devices For Removal Efficiency By Particle Size."

Readings were taken of outside air to compare. We are also comparing the readings to exterior air. The general observation of counting the particle was that there are many irregular and unequal conditions relating to air quality.

The following are field data from aggressive particle profiling . These are the actual authentic field notes from mapping to decrease duplicating error.

Location	3	5	7	1.0	3.0	5.0	TIME	Microns
BASINMENT	16453	1588	440	164	49	2		
① Living	17186	1898	678	357	198	17		
① Living	17307	1886	667	357	188	11		
② BLD SW	19201	2160	983	649	374	48		
② BLD SE	21737	2345	985	594	363	42		
OVERSE	19633	2649	915	376	119	7		

The following are conclusions to be drawn from the air particle testing:

1. There is significant airborne particulate contamination in this dwelling.
2. Particulate includes, mold spores, construction dust, drywall dust, glass fibers, pollen, and other debris.
3. Particulate cleaning with the use of HEPA and other cleaning techniques is advised.
4. Duct cleaning is advised.

Recommendations regarding this information:

- The sources of the airborne particulate should be identified and mitigated.
- Review the recommendations in the mold report.
- The document ACR 2002 Assessment, Cleaning & Restoration of HVAC Systems should be purchased and reviewed. The National Air Duct Cleaners Association publishes this document: NADCA. Their recommended procedures should be used and guidelines.
- If you are an immune compromised individual, proper air scrubbing apparatus should be used to clean the particulate contamination in your dwelling. Portable air scrubbers are available.
- We are not health specialists. The conclusions and opinions stated in this report are based on information gathered over time and the review of similar situations and conditions.
- Ambassador Construction Consultants Inc. does not accept any responsibility for the financial or health consequences of subsequent action taken by the client or its consultants based on this report, test results, opinions or recommendations. We strongly recommend second opinions.

Microbial Data
Microbial Section

On 1-18-05, there were no mold tests taken at the above address.

Scope and purpose:

Spore growth is cultivated by the presence of a sympathetic environment. Food, (cellulose or wallpaper paste), moisture and limited light are conditions in which spores thrive. This is whether they enter from the exterior or any other means. Events such as dusting, opening the windows, vacuuming, and manipulating the contaminated areas, are conditions that stimulate spore movement throughout the house.

There are no thresholds for mold contamination levels. This is all individual difference and the health affects should be considered by a health specialist.

These are the following where visual fungal reservoirs were observed.

1. The attic timbers have some fungal reservoirs.
2. The interstitial space is assumed to have fungal reservoirs amplifying due to the melting of ice dams.
3. Other locations were found to have fungal reservoirs amplifying.
4. Finding all present or past fungal reservoirs was not part of the scope of this inspection. Fungal reservoirs exist on numerous walls, on exterior siding, north rooms, and other potential interstitial locations.

Due to visual fungal reservoirs and calculated optimal conditions for fungal amplification, a full microbial assessment can be done. Tape lift testing, swab testing, viable air, and non-viable air testing can be conducted at some future date if deemed. It is our professional opinion⁵, that if you see mold or smell mold you pretty much have mold. It is also our opinion that all molds are bad and moisture maintenance must be implemented.

Ambassador Construction Consultants Inc. does not accept any responsibility for the financial or health consequences of subsequent action taken by the client or its consultants based on these mold test results, opinions, or recommendations. We strongly recommend second opinions. This report is not transferable and all third parties should procure their own microbial investigations.

All repairs to this property should be monitored by a third party in regards to compliance to existing building codes; industry established standards of practice and for good and workmanlike manner. Please read and review all sections of this report.

Executive Summary For Ice Dams and Mold

It is my professional opinion that;

1. The roofing contractor changed the anatomy of your home. The roofing contractor did not take into consideration the necessary needed ventilation. Because of poor ventilation, your home-sustained major ice dams that ultimately resulted in major structural damage.

⁵ Marko Emil Vovk is the co-author of "The Illustrated Mold Handbook" and has the capability to form opinions on mold.


2. The roofing membrane and flashing we installed in a non-professional manner. The roofing contractor did not incorporate due diligence, and proper standard of care.
3. The result of melting ice dams are; damaged roofing, damaged plaster ceilings, damaged plaster walls, interstitial mold, and indoor air contamination.
4. The roofing system needs to be repaired. The roofing system needs proper insulation and proper ventilation. The interior of the home needs to be repaired and rid of mold. (WE DID NOT WALK THE ROOF TODAY)
5. The home flashing and roofing system is failing. The result of these failing systems is roof leaks during wind driven rains, and roof leaks due to winter ice dam melts.

DISCLAIMER

This inspection should be considered partial, time-limited, non-destructive, and strictly opinion oriented. All opinions were generated from visual and non-destructive testing. We can at some future date perform destructive testing the would include soil borings, water table monitoring, soil analysis, pecculation studiers and full review by a geo-technical engineer. We can also 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, floors, walls, joists, beams, headers, stairs, exterior, grounds, garage, stairs, heating, cooling, appliances, lead paint, radon gas, pest, or any other home inspection related field constituents. 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 mitigation repair, an exact repair estimate, an full environmental inspection, a load study, a determination of footing size or footing depth, a determination of possible future conditions, a determination of future wall settlement, a code inspection, a prediction of additional cracking, a geotechnical soil investigation, and engineering calculation, a prediction of settlement, a run-off study, a boring inspection, a water table evaluation, and underground sewer exploration, basement seepage exploration a camera study, or any other technically exhaustive inspection that may require a more precise investigation. Furthermore, this inspection only includes visual conditions that can promote fungal development, fungal amplification, ice dams, poor ventilation, and failed concrete pavements. I have taken over 75 digital images. Furthermore, this is not a full microbial assessment. We can in the future conduct additional sampling for additional fees. These images are used to write this report.

If you have any questions pertaining to this matter, please feel free to contact me at 216-924-TEST / 216-431-TEST / 216-521-0790 FAX.

Respectfully submitted,



Marko E. Vovk
Civil Engineer / ASHI Certified / CIE / Building Scientist