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THE FOLLOWING REPORT MAY CONSIST OF PHOTOGRAPHIC EVIDENCE, AS WELL AS MY OPINIONS, CONCERNING THE SUBJECT PROPERTY. SINCE MOLD RELATED ILLNESS IS SUBJECT TO THE INDIVIDUAL OCCUPANTS PRE-DISPOSITION AND THEIR THRESHOLD RESPONSE LEVEL.

THIS REPORT IS INTENDED FOR AND CAN ONLY BE USED BY THE PURCHASER OF THIS REPORT.

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RE: REPAIR OR RESTORATION WORK RECOMMENDED ON THIS REPORT, THE USE OF LICENSED TRAINED AND QUALIFIED PROFESSIONALS IS ALWAYS ADVISED.

Observations during the visual moisture and mold investigation

On Tuesday, November 10, 2009, we were contracted to investigate concerns about a past or present mold growth at:

Interview:

The potential purchaser was not on site for the inspection; however, the Realtor was unaware of health concerns or reasons for the inspection other than precautionary.

Scope:

We evaluated the exterior and grading around the outside of the home.
We investigated inside the home systematically examining the walls and personal belongings for evidence of visible mold growth.
We observed the air handlers.
We examined the crawlspaces.

Observations :

We began the investigation by examining the grading and exterior of the structure. The grading was very poor in many locations and is most likely leading to moisture or water problem on the inside of the home. The original portion of the home is brick and the rear addition is a stucco faced structure. It's difficult to tell with our hand-held moisture meters and even with the use of a thermal imaging camera, but there appeared to be areas of moisture behind some of the walls.



Structure is not my background; however some areas of the stucco wall sound very hollow when struck with your fist.

Many years ago the windows were replaced with vinyl replacement windows; however, the trim is in need of caulk.



As we entered the home, a stale or musty odor could be noticed. We began our observations in the basement where the smell of obvious mold growth was pungent and consistent. The odor associated with mold and mold growth is MVOC, microbial [volatile organic compounds](#).

We began our investigation by systematically examining behind the doors and walls that are located in the basement.

It became quickly obvious that this house has suffered from moisture problems from day one. Numerous attempts have been made to control the moisture intrusion including waterproofing paint, a retrofit interior drain tile system, plastic sheeting against the damp walls, and a battery backup on the sump pump.



Probably a good time for a little building background:

Buildings used to be constructed over cellars. Cellars were dank, dark places where coal was stored. People never intended to live in cellars. Now we have things called basements that have pool tables, media centers and play rooms. Cellars were easy to construct – rubble, stone, bricks and sometimes block. If they got wet or were damp so what? Basements are different. They are not easy to construct if we intend to live in them. They need to be dry, comfortable and keep contaminants out. Due primarily to the cost of homes, over the last 50 years, there has been a notable expansion of living space. The useful conditioned space of building enclosures is expanding to the outer edge of the building skin. Attics, crawlspaces, garages and basements are valuable real estate that are being used to live in or used for storage or places to locate mechanical systems. Basements are viewed by many as cheap space that can easily be incorporated into a home. Keeping basements dry, comfortable and contaminant free is proving to be anything but simple. Things are further complicated, in Maryland, due to the building code requirement that interior footer drains, (referred to as French drains), be installed under the basement floor, when 95% of the time they belong outside of the foundation perimeter. Please understand that interior drain tiles are designed to control sub-terrain occurring hydrostatic water pressure. (high water table). Over 90% of basement moisture issues begin with surface rain water, not ground water, yet the interior drain tile is designed for ground water control.

Another potential problem that we find consistently in this part of the country is air-conditioned basements. When cold surfaces meet high humidity, [condensation](#) can result. Air conditioning systems generally produce air temperatures between 55° and 60°, so with our example let's say your room temperature is about 70°. If we allow the relative humidity to get to 70%, the [dew point](#) is around 59°. With this example, an air-conditioned basement, or any basement that has air conditioning upstairs, will allow condensation occur when any item in the room reaches around 59°. What we're saying is a house can form biological growth without visible liquid water or obvious water leaks.

The good news about this home on ***** is the fact that although we are dealing with horizontal and possibly vertical hydrostatic water pressure, the water proofing system has already been retrofit in place. Modifications, to the outside of this home, cannot be made without overwhelming expense.

The unfortunate aspect of this basement is the building materials that were used are not well tolerated with damp basement environments. The work was not done in violation of the building code; however no specific building code exists for building belowground.

Visible mold growth, identified on site as [Aspergillus](#), could be found on almost every wall, door, or surface from the floor up to about 4 feet.





I could go on with the pictures but I believe you get the point.

There are active plumbing leaks in the plumbing pipes and the sewer and drain.



A waterproofing system has been retrofitted with plastic sheeting to control wall seepage and vapor intrusion. Unfortunately, the installers did not seal the plastic airtight to the wall and waterproofing system. This will of course allow vapor or moisture, as well as odor, to permeate the basement and contaminate the building materials.



Many homes have an issue with higher humidity. The solution most of the time is properly grading the exterior and extending the downspouts and sump pump discharge. The next step on the outside would be installation of an exterior footer drain tile system. Many people have had installed a retrofit interior drainage system to attempt to correct a moisture problem. Unfortunately, these systems are designed to trap and drain water that is being

forced into the home via true hydrostatic pressure and then leaking on the floor from foundation leaks and not to control dampness or moisture. These expensive and many times unnecessary systems can promote a mold or odor problem in a basement. The use of a dehumidifier is common, but requires drainage and lots of electricity. Your BGE bill will usually give costs of some appliances and shows a dehumidifier above \$20.00 a month.

For years, we have been teaching people about the side benefits of a radon mitigation system or an active dampness control system. One of the best is the effect on basement moisture. A radon system consists of a 3" or so PVC pipe put through the basement floor, or under plastic covered crawlspaces, and hooked to a fan to suck the radon out from under the home. A radon molecule is 10 times smaller than a moisture molecule, so while the system is removing radon it may remove much of the moisture. These systems can be modified for block wall suction very easily using a smaller pipe tapping from the main pipe. ***If a plastic sheet has been installed against the foundation walls, with the waterproofing system already in place, these plastic sheets can be easily depressurized to control moisture and allow future building.***

There are other factors to be determined, but I have seen systems eliminate as many as three dehumidifiers in a single house. The cost of a typical radon or sub-slab ventilation system starts at under \$900.00. The cost to operate is less than \$3.00 a month. The system will suck out: moisture, mold spores, mildews, lawn chemicals, musty odors and more. They last about twenty years without maintenance and will then need a fan replacement for about \$200.00 at that point. These systems do not affect the fair market value, resale value or the marketability of your home since the average radon reading in Maryland is above the EPA's action level. Therefore, a system should be considered an amenity to the home, similar to an electronic air cleaner. Keep this concept in mind when determining how to correct above average moisture in your home.

The basement walls have been painted with waterproofing paint. Stopping moisture is very important; however it should have been done from the outside before painting the walls.

The use of the waterproofing paint can assist with water vapor. The paint that was used was not designed for this application. It was designed for new and

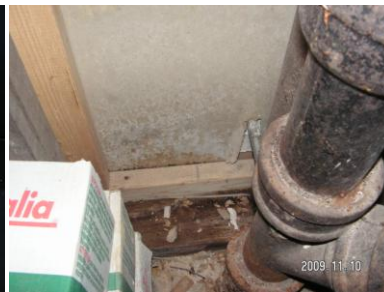
dry walls and allows mold to grow on the subsurface. These walls should be scraped and wire brushed and repainted with a paint containing an anti-microbial compound, unless the plastic can be air sealed, which is what I recommend.



An apparent plumbing leak, in the basement bathroom, has been repaired; however, visible mold growth remains.



The sheet rock wall behind the toilet shows 100% moisture and exhibits black mold identified on site as [Stachybotrys](#).



The unfinished room that contains the lower air handler has visible mold growth all along the walls, including areas of Stachybotrys.



When we examined the lower air handler, we found it to be fully contaminated with mold growth and located with a cold air return directly over a hole in the floor which allows musty odors and mold to be drawn directly into the air handler.



We continued investigation onto the first floor and found mold grows on the pocket doors between the dining room and the kitchen.



Also on the first floor in the room, directly below the second floor bathroom, that I'll identify as a library, [efflorescence](#) could be seen on the ceiling plaster from a leak in the bathtub above.



When I examined the bathroom above, I found the water was running in a tub and drain pipes in the tub was leaking into the ceiling. There are no shutoff valves for the tub supply lines so I shut the valves off as tightly as I could and water seemed to stop.



We continued investigation on the first floor and found past water damage in the ceiling of the second kitchen. This area has been examined with a moisture meter and numerous puncture holes were left in the ceiling to attempt to quantify the water damage. We followed up on that investigation and found visible water damage on the exterior facing wall of the second kitchen. Water stains could be seen through the wall tiles.



We continued investigation onto the second floor and immediately began in this small unimproved bathroom above the aforementioned second kitchen. Evidence of plumbing damage to the vanity was obvious; however, an active wet area could be found in the ceiling and the wall behind the toilet.



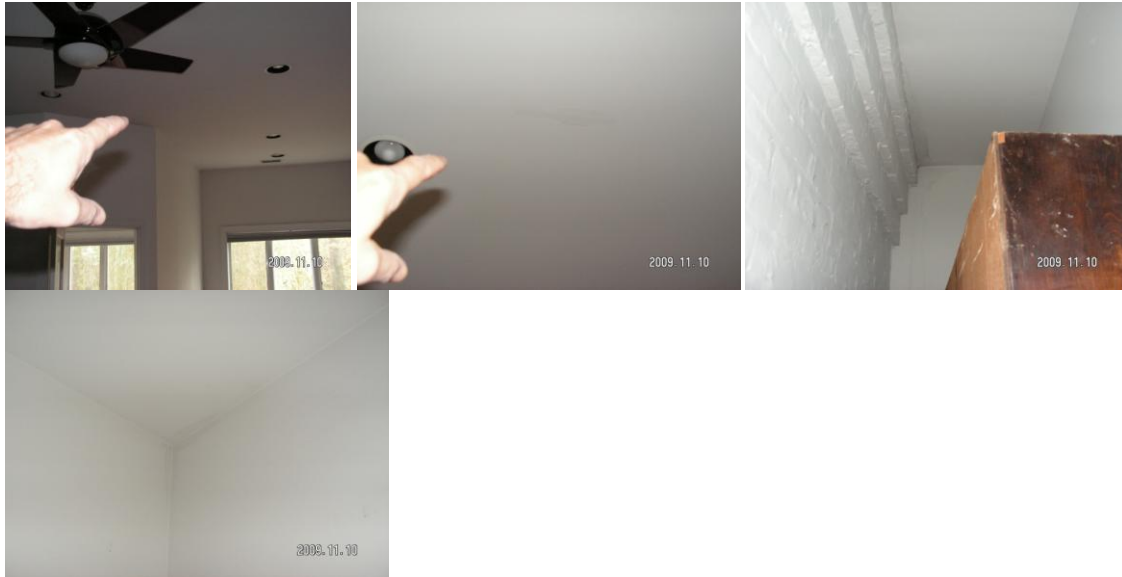
The wax ring under the toilet may be deteriorated as well, but due to all the moisture around it's difficult to isolate that spot.



We continued the investigation into the center room, next to the attic access, and found multiple active areas of ceiling damage, mold, efflorescence from a roofing leak. Once again using our hand-held moisture meter and a thermal imaging camera, we found these areas to be actively wet



We continued investigation through this second floor, which included the bathroom with a leaking bathtub, and then finally into the master bedroom which is located in an addition to this house. Evidence of past water damage to the ceiling was evident; however, was dry during our inspection. We continued through the master bath and into the final room that leads to the outside balcony. The corner of that room as well as the closet show evidence of past water leaks in damage to the ceiling. During our investigation these areas were dry.



We took advantage of the balcony and walked the flat and partially flat roofs on the very back of the home and found them to be in questionable condition. I am not a roofer but I would strongly recommend a roofing contractor to certify all of the roofs on this building.



We continue the inspection into the attic and found evidence of water leaks in a few portions of this roof. The ceiling leaks over the center room were evidenced by damage to the floor; however, the ceiling leak in the unimproved bathroom could not be readily determined and will need a roofing contractor.



We opened and evaluated both air handlers in the attic and found them to be fully contaminated with mold growth.



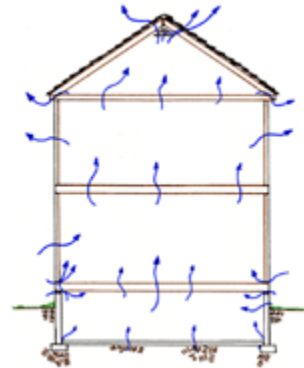
At this point we entered and examined the crawlspace. We found this crawlspace to be wet and without a vapor barrier in some locations. Installation is fallen in a number of places and visible mold growth is prevalent throughout. The room with washer and dryer shows damage to the joists as well as the subflooring likely due to the exterior wall we had mentioned earlier.



The problem with dirt or vented crawlspaces is that as warm air rises in your home, it brings up with it the air that was previously in your crawlspace, including moisture and mold spores, as well as anything else that may be airborne down there.

As this air rises in your home, replacement air enters from the lowest part, your crawlspace. This replacement air is made up with unconditioned outside air that enters through vents and other leaks, and air that is actually sucked from the crawlspace floor, either dirt or concrete, which is typically filled with lots of moisture. This natural upward air movement is called the stack or chimney effect -- this is how chimneys work. Consequently, whatever is in the air at the lowest point eventually flows up into the living sections. Up to **40%** of the air we breathe on the first floor of our home comes from the crawlspace.

A concrete or dirt crawlspace with crawlspace vents is a never-ending source of moisture. Even if the dirt's surface seems dry, digging down a few inches reveals moist earth. You would like to keep the overall humidity under 60% at all times, but, every morning the relative humidity is above 90%. Where do you think that moisture goes?



Why Is Crawlspace Moisture so Bad?

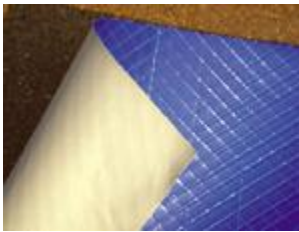
Because it's the moisture that leads to mold growth, musty odors, and structural damage, not to mention that insects and critters love moist

environments and energy costs are higher. Moisture ruins houses by providing a hospitable environment for mold, fungi, and insects that destroy wood framing. Crawlspace moisture, and the mold and mildew that thrive in this environment, affect not only the floor system directly above, but also the entire house.

Three things destroy organic materials in general, and wood in particular: moisture, heat, and ultra-violet radiation. Of these, moisture is by far the most damaging... and the one we can control.

Properly sealing the crawlspace and removing the moisture from the ground and air is part of the solution that helps provide a mold-free, radon-free, and insect-free environment, which leads to a more energy-efficient and healthier home.

To avoid moisture's negative effects, a crawlspace should be completely sealed and isolated from the ground and the humid outside air. An effective method to lower crawlspace humidity is a crawlspace encapsulation system. This crawlspace vapor barrier system involves installing a liner of high or low-density polyethylene with polyester-cord reinforcement on the dirt or concrete floor, which is fastened or sealed with epoxy to the walls, above the grade level and highest water stain. This heavy reinforced lining can be made especially with an antimicrobial finish that protects against mold and mildew growth under the crawlspace liner.



To complete the system, a sub-membrane ventilation system (radon system) can be installed to control the moisture with the need for large expensive dehumidifiers.

Lower energy bills, resulting from reduced crawlspace humidity, translate into comfort and savings year after year. The crawlspace vapor barrier should be tough enough for service people to crawl on and safe enough for storage. Being bright, the liner really brightens a crawlspace too, making it a relatively pleasant storage place.

Just remember that your crawlspace, although often neglected until it's too late, is one of the most important spaces in your home. It can be a spawning ground for mold, bugs, embarrassing odors, and even radon gas. The moisture

generated in the crawlspace will lead to structural damage and higher energy costs! On the other hand, a clean, sealed crawlspace can be an extra source for much needed storage while making your home more energy efficient, healthy, and safe for your family.



Recommendations:

First things first, contact a plumber to address the water leaks sewer drain line, second-floor tub, the old supply line caps.

Although many attempts to waterproof this home have been attempted, we still have excessive humidity and vapor intrusion that has led to rampant mold growth throughout the basement. The best and most cost-effective way to address this basement would be to completely gut it by removing all horizontal and vertical building materials. Once the sheet rock is been removed, a determination can be made as to whether or not the studding needs to be removed. Once this has been accomplished, I would recommend that the plastic against the walls be permanently sealed onto the wall and into the waterproofing system. At this point an active dampness control system, radon system, can be installed to de-vaporized and depressurize the floor and walls.

This will allow the basement to be rebuilt without the concern of recurrence of mold or moisture.

Install a low temperature dehumidifier, configured in a continuous operation mode to prevent the need for constant emptying of the condensation buckets. The relative humidity needs to be kept below 55%
I would recommend a Frididaire 50 or 70 pint low temperature dehumidifier.

<http://www.lowes.com/lowes/lkn?action=productDetail&productId=288373-70213-FDL70S1&lpage=none>

Where it is impossible to put the plastic sheet against the foundation wall, recoat these walls with Zinsser Watertite.
Following the manufacturer's instructions apply Zinsser Watertite to the foundation wall.



http://zinsser.com/product_detail.asp?ProductID=77

If any sheet rock is to be replaced, use the following Georgia-Pacific product:

Georgia-Pacific makes a fiberglass faced sheet rock product that would be perfect for this location. Densarmor



<http://www.gp.com/build/Product.aspx?pid=4659>

The air handlers are contaminated with active and dormant mold growth. Visible mold growth is common in air handlers and can be bio-cleaned, in some circumstances, and the unit salvaged. The configuration of this system could be contributing to the rapid mold growth as well as the poor filter practice. Consider using a disposable pleated filter with a Merv rating of 11 to 14.

These filters cost about \$9.00 each and can improve the overall air quality by removing all particles .3 microns and above. (All mold spores are 3 micron and above)

Consider operating the air handler in the (on) position to assist with de-stratification of the indoor air. (Proper temperature mixing)

Check with the inspector or HVACs contractor to evaluate the system performance. Often it is more cost effective to replace an older or poorly performing unit, then to bio-clean and replace moldy insulation panels

Check with your mold remediation contractor or hire a licensed HVAC contractor to decontaminate the air handlers and the ducts.

Have a licensed roofing contractor examine the various roof systems on this home. Since during our inspections we found wet and active water leaks in multiple areas of the ceiling, a licensed roofer should examine this roof and certify its integrity.

A mold or remediation contractor should also decontaminate the crawlspace after any needed structural repairs have been accomplished. This will include the removal of the affected insulation to determine the extent of the water intrusion into the building. Because of the water intrusion, likely the

aforementioned corner and downspout area, will need to be rectified to prevent recurrence.



If the new occupants of this home have any genetic predisposition's towards asthma or allergies, they should consider a biological wipe down of the entire home before taking occupancy.

Please feel free to call me with any questions about this report;

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