

# Part II December 2010 Newsletter from Building Diagnostics

Welcome to the December update. I had hoped to have a couple of topics that have been on the back burner for a while, but something came up (see below) that took up a lot of time. So below you will see a brief cautionary tale, a little about reading and philosophy and along with that a little about upcoming newsletter topics.

I hope that you are all enjoying the delights of family, friends and over eating opportunities this holiday season and that your new year keeps you all well; and attentive.

## This Month's Topics: Don't answer the phone!

A sensible person would not have returned the call. The message on the answering machine was not what I usually hear. Something about "My house is making me sick, I'm not getting enough oxygen." Being sensible has never been a strong suit for me so I dialed.

The homeowner actually had all the facts nicely assembled and even had partially diagnosed the problem. In the fall when she closed up the windows etc. but before the cold weather set in she had severe malaise, tiredness and lack of appetite. As soon as the weather turned cold she felt better until the next fall. This was the third year of this pattern and each year the doctors couldn't identify any health issues. She said that it had begun after she had her doors and windows replaced and that a day or two away from home made her feel better. We ran through several situations and everything pointed to the house as the culprit.

These types of problems are risky to get involved with. The homeowner could be a hypochondriac kook, a lawsuit happy person looking for the next "opportunity" or just an unhappy lonely type looking for someone to talk to. I have encountered all of these over the years.

But this homeowner seemed sensible, smart and resourceful, so I went there the next morning. Here are some of the things I checked. First a carbon monoxide reading, which was zero as I anticipated because the homeowner had two CO detectors, both fairly new. The atmospherically vented propane boiler passed the combustion safety easily and the house was fairly leaky, 2040 CFM50 blower door reading in a 1100 square foot ranch with low ceilings and 900 square foot basement (2165 CFM50 with the basement door open).

By this time I had already spotted what I was convinced was the culprit but I still had to figure out the pattern and make sure that it fit my hypothesis. Those of you who regularly test houses have already spotted that the basement and upstairs are well connected. Even with the basement door open there is only a 125 CFM50 increase. My "suspect" was in the basement so that connection certainly allowed it access to the living area.

So we have air pollution in the basement of a leaky house. That is surprisingly common, basements are often chock full of bad things, but it usually doesn't make the occupants sick. So why was this case different? First is the ceiling height. With a living area with ceilings just barely at seven feet and the house sitting low to the ground the total exposed height of the building (from outside grade to finished ceiling) was barely more than eight feet. That

minimized the stack effect in the building so that even though it was leaky there wasn't enough pressure difference between the upper and lower exposed areas to actually move a lot of air in and out of the house.

The second thing was volume, in this case, of pollutants. The owners husband had passed away several years earlier and the basement had hardly been touched since. He was an ambitious groundskeeper and home improver so he had a large (immense for the space) supply of paint removers, finishes, thinners, pesticides and misc. other stuff that I lost count of. Most of it was in metal cans many of which were on the concrete floor. At least a couple of those were rusted out at the bottom and many seemed to be poorly closed. Although I didn't do specific air sampling for volatile organic compounds (VOCs) because of the cost. I did use my combustible gas detector to sniff around the basement. Every time I got near a suspected source the thing went crazy. This is not a diagnostic test but given the high cost and lead time of getting an actual air sample tested I used it. Don't forget, I would have needed several samples to get an accurate VOC profile and we have quickly spent several thousands of dollars. And it wouldn't have contributed to solving the problem.

Back to the house and why the polluted air was stagnating. I think its very simple. As I mentioned there is very little vertical distance in this house and the symptoms were occurring during periods of only moderate temperature difference. Classic conditions for cutting down on infiltration. The owner keeps at least some windows open "from spring 'til late as I can stand it" so that would provide additional ventilation. The problem disappears in the cold weather when the temperature difference kicks in to drive infiltration. It all seems so reasonable, I hope I have it right.

To cure the problem it's simple, move the stuff out. Except then what do you do with it? In this case it's a real problem. The quantity is well above what a local hazardous waste day would accept, for several years. I've contacted a few people about reuse opportunities and would love to hear more if anyone has suggestions. For now I have encouraged the family to find room in a screen house to get the majority of the containers out of the basement.

That was the belt, the suspenders; a small exhaust fan in the basement to keep the basement at a slightly negative pressure relative to the rest of the house. I don't know if any of the materials have soaked into either the wood or concrete in the basement so I'm not ready to take the chance that removal is a 100% cure. I'll do a thorough test out to confirm that there are no combustion safety issues and to ensure that the pressure is negative relative to the living space.

I have already delivered a series of documents from the EPA regarding good IAQ practices. Followup will include suggestions for waste haulers who could deal with the material if other methods do not succeed. Next fall I intend to repeat the test out procedure just to be sure.

I included this as a reminder that ultimately human health and well being trump concerns over energy. This is also a reminder that buildings don't necessarily self ventilate even if we measure them as leaky. We need to understand and account for the interactions that our tools and software don't. Planned (and continuous) ventilation is as important as any other component of a house.

## **Topic #2: Bill reads and thinks about it**

I have been a reader since I was quite young. In grade school I used to ask my classmates to get books from the bookmobile for me because we were limited to five every two weeks and that was a lot less than I would go through. I wasn't fussy, anything that I hadn't read was OK and I would even return them to my accomplices with recommendations as to whether they should read them before the bookmobile returned.

Lately my non work related reading has slipped to an extreme low. In the past year I could only think of two books that qualified as pleasure reads. I got a Borders gift card and decided to rectify the situation so I picked up two recent books that were on my wish list. The first one I read was Bill Bryson's *At Home: A Short History of Private Life*. The second, just started, is *The Grand Design*, by Stephen Hawking and Leonard Mlodinow. The reason I bring this up is that both of these books may influence what appears in this newsletter in the next few months.

I have to point out that the Bryson book covers interesting facts about how we live and how we got there, almost exclusively from a European and American perspective. He covers this in a mere 512 pages. Hawking and Mlodinow take on the apparently lesser topic of how the universe works and how we understand it. All this in 208 pages. Interestingly I think one of the early chapters in *The Grand Design* offers an explanation for this, but I think that will be brought up at a later date.

I want to explore a few new topics in the coming year and perhaps rework and refresh some others (almost no math, really). I think the subject of why buildings should be energy efficient besides to save money deserves more attention. Water usage and the energy associated with that is not discussed as often as it should be so that will be coming up. I probably will not go into quantum physics, although I may try to show why it is applicable even on the scale we typically work at. What's more valuable, large scale renewable projects or residential roof tops? There are lots of interesting things out there, tell me what I should write about.

I am willing to entertain suggestions, rebuttals and guest pieces for the next year. Don't be afraid to speak up and let me know what you want. I can't promise that I will follow every suggestion but at least I will know what issues are most near and dear to you.

## **Topic #3: Year end thanks**

Once again I want you to know how much I enjoy hearing from you, even when it is to point out the error(s) of my ways. I make so many mistakes that I am extremely used to that now.

Thank you for listening. I know how valuable time is to all of us, I appreciate that you spend a bit of it with me.