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Allison A Bailes III, Ph.D.

A House Needs to Breathe..... or Does It?

This week we welcomed Dr. Allison Bailes of the Energy Vanguard to talk about his new book *A House Needs to Breathe..... or Does It?*. We discussed his thoughts on **proper ways to make homes comfortable, healthy and energy efficient**. Dr. Bailes is widely known for his excellent writing in the Energy Vanguard blog.

Allison A. Bailes III, PhD, is founder and owner of Energy Vanguard in Decatur, Georgia. Like many in the field of building science and green building, he is multi-faceted: His academic credentials in physics (BS, MS, MST, and PhD all in that field) give him a solid foundation in the science that underlies buildings. Having taught physics at the high school and college levels, he's adept at explaining technical concepts in a way that people new to green building can understand. In addition, he has practical, hands-on experience. He built a high-performance home out of structural insulated panels, doing much of the work himself, and ran a home performance contracting business. Numerous homes in the Atlanta area had their ducts sealed and crawl spaces encapsulated by Dr. Bailes himself. Between his first and second businesses in this field, he gained more green building experience by working as the regional manager for the EarthCraft House program in the Southeast. What Dr. Bailes has become most known for in recent years, though, is writing the Energy Vanguard blog <https://www.energyvanguard.com/blog/>. In it he covers everything from building science fundamentals to HVAC particulars to big-picture topics like energy security and peak oil. The blog has gained a wide readership in a short time and is often cited and linked to from other websites.

Nuggets mined from today's episode:

It's been going on 10 years since you last appeared on IAQRadio.

A former physics teacher who built his own home, Dr. Bailes learned building science and design along the way. After living in his home for 3 years, he learned that the capacity of his HVAC system was twice what was needed.

Do things in the right order or it will be very costly to fix later.

"A House Needs to Breathe.....or Does It?" is the title of Allison Bailes' new book. The book is designed for use for those early in the building curve: builders, HVAC contractors, real estate

agents, appraisers, etc. The book introduces building science and other concepts at a 201 level. The book contains 3 parts: Start at the end, The Building Enclosure and The Mechanical Systems.

Beginning with the end in mind (what occupants need from their home?) IEQ is the place to start and where Dr. Bailes' book begins.

Energy efficiency is the gateway drug to building science and IEQ.

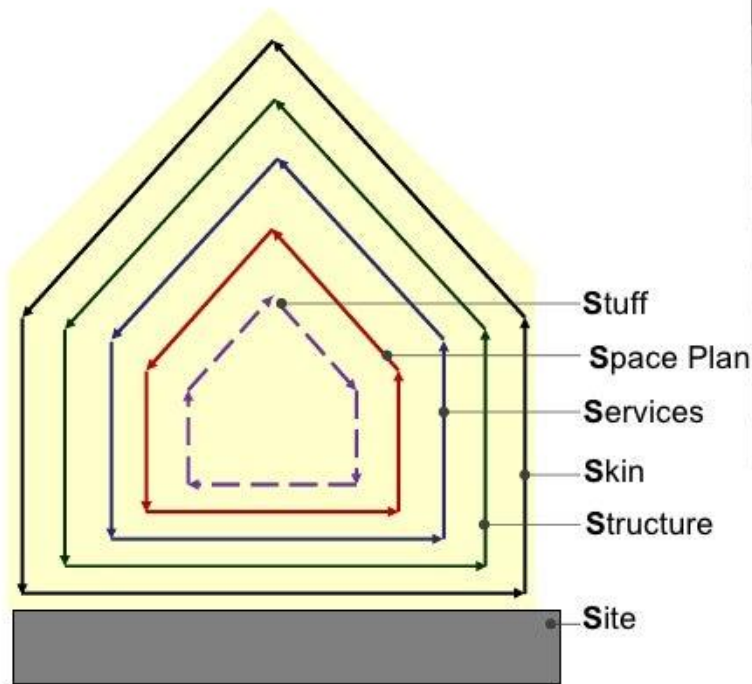
He credits Robert Bean as a big influence, "design for people and good buildings will follow".

Joe Lstiburek says: "Focus on the building and the efficiency and IEQ will follow".

The Building Enclosure is a Bathtub and The Mechanical Systems are the faucet.

Stewart Brand (known for the Whole Earth catalog, "the Well" computer network and the book How Buildings Learn." Brand's "shearing layers of change" (6 Ss: Stuff, Space Plan, Services, Skin and Structure. The first 4 change quickly while the last two change slowly.

Shearing Layers of Change



The Layers: Site, Structure, Skin, Services, Space Plan and Stuff is defined as follows:

Site - This is the geographical setting, the urban location and the legally defined lot, whose boundaries and context outlast generations of ephemeral buildings.

Structure - The foundation and load-bearing elements are perilous and expensive to change, so people don't. These are the building. Structural life ranges from 30 to 300 years (but few buildings make it past 60, for other reasons).

Skin - Exterior surfaces now change every 20 years or so, to keep up with fashion or technology, or for wholesale repair. Recent focus on energy costs has led to re-engineered Skins that they are airtight and better insulated.

Services - These are the working guts of a building: communications wiring, electrical wiring, plumbing, sprinkler system, HVAC (heating, ventilating and air conditioning), and moving parts like elevators and escalators. They wear out or obsolesce every 7 to 15 years. Many buildings are demolished early if their outdated systems are too deeply embedded to replace easily.

Space Plan - The interior layout - where walls, ceilings, floors and doors go. Turbulent commercial space can change every 3 years or so; exceptionally quiet homes might wait 30 years.

Stuff - Chairs, desks, phones, pictures; kitchen appliances, lamps, hairbrushes, all the things that twitch around daily to monthly. Furniture is called mobilia in Italian for good reason." [Brand, 1994, p.12-13]

The state of Georgia has required blower door testing for over 10 years.

Air barriers have improved but mechanical systems not as much. He credits this improvement to the increased use of air barrier testing. There are no similar tests for moisture control or mechanical systems.

Dr. Bailes is a fan of variable speed mini split heat pumps. He uses multiple units in his home, both wall mounted and ducted. Heat and cooling loads vary constantly within buildings, fixed capacity equipment cannot adjust to load and are either all on or all off. Cleaning wall mounted units is challenging, filters are not highly efficient and microbial growth can be an issue. For ducted systems a filtration formula of 2 square feet (LxW) per 400 F³/min of airflow works.

When trying to integrate sustainability with IEQ, IEQ must come first.

Text question regarding potential risk of EMFs posed by growth of WiFi and IoT (Internet of Things) devices: We've had electrified homes for over a century, we've had computer equipment for half a century, if EMFs were a widespread problem we would know about it.

Naked people need building science. Our bodies are constantly giving off heat. In winter we don't want to radiate heat away too quickly. Dr Robyn Pender is a buildings physicist and a senior building conservation advisor in Historic England's Building Conservation Team. She found that covering walls in stone buildings with tapestries functioned as a radiant barrier and helped keep occupants warm.

The answer to the question posed by his book title "A House Needs to Breathe..... or Does It?" is NO.

James Peters says: "if you find yourself inside something that is breathing, get out! You've been eaten." Air leakage into a home is bad. Think of what the air passed over on its path inward.

When air leaks in from wherever, it could come through the garage with all its fumes, pesticides etc. or from the moldy crawlspace or the dirty attic with the dead squirrel.

Control layers govern the flow of heat, air, moisture (liquid/vapor). As close to zero flow as possible is desirable. Vapor control is more complex. Allison added Control layers to Stewart Brands, Shearing Layers and showed that detail during the show.

Joe Lsiburek's perfect wall adds control layers on the exterior. Allison concurs that it is easier to add control layers outside. Control layers help protect a home from thermal and moisture cycling.

Roundup

Future of homes is that they will get better and better with implementation of building science into: design, building, operation and maintenance of buildings.

Monitoring sensors are getting better (PM 2.5, heat, humidity, chemicals, CO², etc.). We need to learn from the info sensors provide in order to offer better advice to clients.

Dehumidification is needed in tighter homes.

Do Not Set Heat pumps to Emergency Heat when the temperature drops to 40°F

Recommends: <https://hammerandhand.com/best-practices/manual/>

Many oversized mini split heat pump systems have been installed. It's likely that they are operating at lowest capacity. They should be sized based from bottom-up and be able to modulate upward as required.

Some supply chain issues remain in marketplace. Higher prices may slow sales and help build product inventories.

Therma-Stor has introduced a new thermostat that is controlled by dewpoint. Dehumidification advocates like Lew Harriman have been asking for this for years.

Global restoration watchdog Pete Consigli:

- Enough about building science can we talk about food now?
- Andy Ask Building Science Symposium exciting program. Featuring Building Science Pioneers Panel. Post Conference Event including: Response and Recovery Panel. For more information: Link to more information: <https://www.climatezoneone.com/>
- Realization that more and more dehumidification is needed in hot humid climates.
- HVAC contractors in Florida are experiencing supply chain problems.
- Tourism down in Florida as snowbirds don't have places to stay.
- New code restrictions after Hurricane Ian?

Z-Man signing off

Trivia:

Name the Ohio State graduate student whose accidental discovery was the breakthrough in creating our most popular insulating material?

Answer: Dale Kleist, fiberglass