Do green building methods work for people with environmental sensitivities?

Building methods that are "green," "ecological" or "sustainable" are sometimes not usable for environmentally safe housing. We discuss some pitfalls when using green building methods.

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People with environmental sensitivities need an indoor air quality far beyond what is common in normal housing. Regular materials, such as carpeting and manufactured wood products, are generally not acceptable because of the fumes they generate.

When building a new home or renovating an existing one, it seems the obvious choice to use a green builder. After all, the green builders focus on natural materials instead of the toxic stuff used in regular construction. Unfortunately, it's not so simple. Some people

with chemical sensitivities (MCS) have found it frustrating to try to work with green builders. Many of their practices are not suitable for the most sensitive people, but may work well for the moderately sensitive.

Focus on green

The U.S. Environmental Protection Agency defines green building as:

> *Green building is the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life-cycle from siting to design, construction, operation, maintenance, renovation and deconstruction. (EPA, 2016)*

In practice that means green builders typically focus on:

- Energy efficient heating/cooling
- Less energy-consuming materials
- Recycled/reused materials
- Natural materials
- Low VOC materials

Natural and less energy-consuming building materials

The green builders focus on using natural materials that use less energy to manufacture, such as wood, adobe and straw bales. These materials can be problematic to highly sensitive people.

Wood emits natural volatile organic compounds (VOCs) called terpenes. Terpenes are what gives the smell of a pine forest. Some types of wood emit fewer terpenes than pine, but they are more costly.

Even low-terpene types of wood, such as maple and poplar, still offgas terpenes and can be problematic, especially in hot weather.

Natural materials can also create mold problems in a house after several years' use, or if there are water leaks or condensation. To counter that, green builders often add preservatives that may create their own problems.

In contrast, houses built for people with environmental sensitivities (i.e. MCS) often use materials such as:

- glass
- aluminum
- steel
- concrete (additive-free)
- fired bricks
- ceramic tile

(See EI Wellspring, 2016; Rea, 2002)

These materials all take a lot of energy to manufacture and thus are not considered "green" or "sustainable."

Recycled materials

Green builders favor recycled materials instead of using more of the Earth's resources to produce new materials. These include:

- Reused building products
- Recycled paper and cardboard
- Recycled concrete
- Other recycled materials
- Waste products from industry

Using waste products or recycled materials can have a negative effect on the indoor air quality (Steinemann, 2016). Materials that will be recycled are generally considered waste products of very low monetary value, so there is little incentive to take good care of them. Pallets of old paper or cardboard can sit out in the rain for days without anyone getting concerned. Meanwhile, mold will fester and the spores are not killed when the material is reprocessed (Andersen, 2016).

A problem with recycling is that all sorts of trash can find its way into a recycling bin or dumpster, especially if not monitored. This includes household trash, leftover fast food, and more (Russell, 2010). About 25% of what ends up in the recycling bins in the United States is actually trash (CBS News, 2019). (This problem may be worse in some cultures than others.)

Gypsum wallboards (drywall) are often made from recycled materials. The gypsum may be recycled from a demolished house or it can be a waste product from the scrubbers on coal-fired power plants. There are plenty of contamination possibilities in either case. If it comes from a demolished building, the gypsum may have absorbed pesticides, fragrances and other toxics while installed in the previous building. When the building is

demolished, the workers may not protect the gypsum from rain. The pile may sit for days in a dumpster while being rained upon. Drywall is a perfect breeding ground for mold.

Insulation material with recycled content, but what contaminants are there?

If the gypsum comes from a power plant, it is likely to contain impurities from the coal that was burned, including heavy metals. The paper backing is usually recycled material.

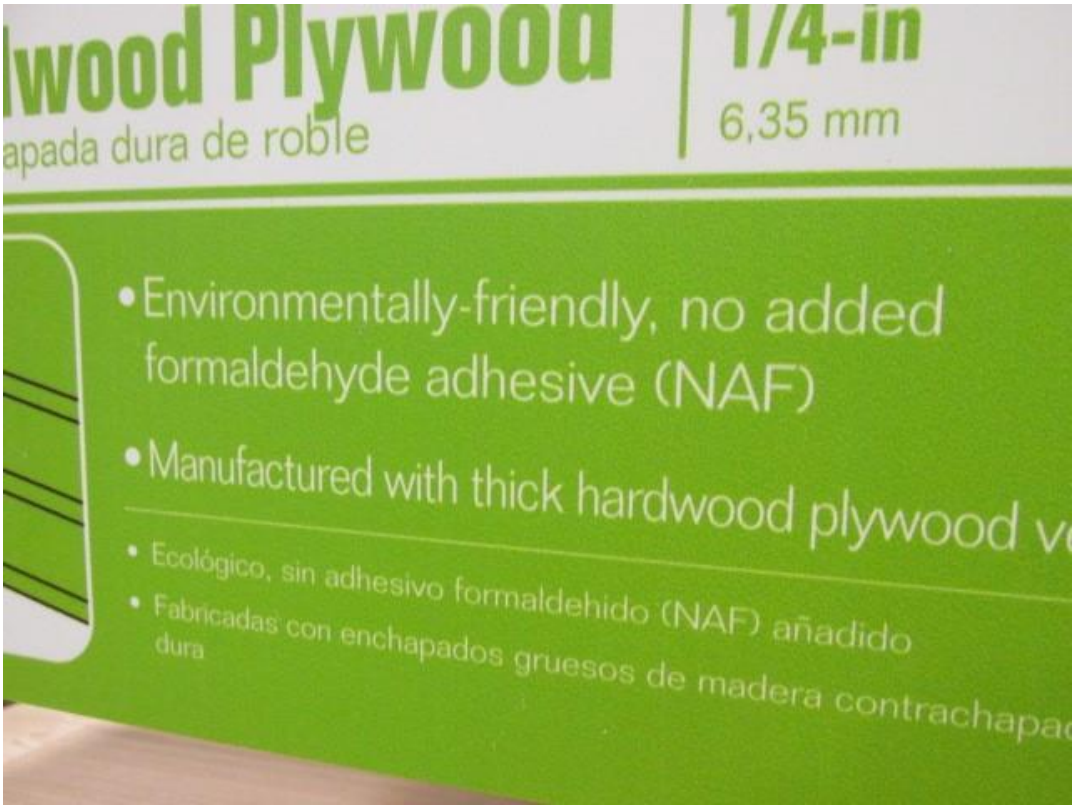
Scientists at the Technical University of Denmark tested thirteen sheets of gypsum drywall they purchased from a multitude of stores. Every sheet contained mold spores just waiting for moisture to flourish. The manufacturing of the sheets did not sterilize the spores (Andersen, 2016).

Fly ash and slagger from coal-fired power plants and other industries are commonly added to concrete, but it can give the concrete a permanent odor that is bothersome to sensitive people.

Ground-up concrete from demolished parking lots and roadways are considered “green” materials to add to new concrete. But what about all the oil spills?

Greenwashing

Greenwashing is when a manufacturer promotes a product as green, but it really isn't. They may make one change that is for the better, but that doesn't make the product green. Such products can still contain fragrances, anti-microbials and many kinds of chemicals with known health effects (Steinemann, 2016).



Plywood advertised as a green product with no formaldehyde "added."
This is not the same as formaldehyde free, as formaldehyde may still be generated by chemical reactions in the glue. And even without formaldehyde, there are probably still other toxic chemicals in the glue.

Windows

Windows are manufactured with frames of vinyl plastic, wood or aluminum. Green builders tend to like the vinyl and wood frames, since they insulate better and have less embedded energy than aluminum. However, wood frames are usually treated with preservatives to protect them against mold and mildew, and need to be painted every few years (Bower, 2000, ch. 9).

Vinyl fames may be tolerable to most people but not all, as they can get quite hot in the summer.

Aluminum frames are available with a thin plastic thermal break, which makes them almost as energy efficient as wood or vinyl (Bower, 2000, ch. 9).

Green paints

Choosing a paint is often the most difficult and most treacherous part of building or renovating a healthy home. There are many types of earth-friendly paints available, but many of them are not friendly to sensitive people (Schieweck, 2015; Steinemann, 2016).

Paints made of natural materials, such as milk paints and clay paints, are healthier for the painter, but they tend to contain preservatives and may never become fully odorless. We have seen several people use these paints and never be able to tolerate them.

The safest type of paint from the perspective of highly sensitive people is baked on powder-coated paint. This is typically used on steel appliances. It is extremely toxic and energy intensive while curing in an oven, but afterwards it is the most inert paint there is.

Some sensitive people prefer high-VOC paints — once they have cured for several months. The low-VOC/zero-VOC latex paints often don't work so well — even long term (Rea, 2002).

Natural walls

Walls made of stuccoed straw bales, logs, adobe, cob, wheat boards and other natural and non-toxic materials seem like the perfect fit and for some sensitive people they work well. But others are not able to live in such houses. The natural terpenes never offgas, not even after a decade. And then there are the mold problems that may show up after some years.

Adobe bricks are often stabilized with asphalt and kerosene, so they are more waterproof (Forrest, 2017).

Insulation

Walls and ceilings are usually not airtight. There are leakage through electrical boxes and other cracks, so it is important that the insulation is tolerable.
Cellulose insulation is typically made of recycled newsprint, with about 15% fire retardants (Wikipedia). Recycled newsprint suffers from the same mold problems mentioned above. Then there are issues with the ink and the flame retardant. In our experience, newspapers are typically less tolerated by environmentally sensitives than most other paper products. We don't know anyone who has actually tried this type of insulation, but MCS building specialist John Bower reports sensitive people having problems with cellulose insulation (Bower, 2000, ch. 12).

Denim insulation is made from recycled jeans. Some of these products are made from post-consumer jeans, which may be contaminated with various laundry products, such as fabric softener. Apparently polyester fibers are usually added, which could be problem. Then the whole mixture is treated with flame retardants.

Natural floors

Natural floors is a relative term. Much of what is sold as "natural" really isn't. Bamboo floors and many wooden floors are actually glued laminates. Even genuine solid hardwood floors can still be a problem due to the terpenes and the occasional need for surface treatment. (EI Wellspring, 2018)

More radical all-natural flooring, such as tamped earth floors that are sealed with linseed oil are problematic, mostly because the linseed oil never becomes odorless.

Bamboo is considered natural, but contains a lot of glue and is not suitable for the very sensitive.

Composting toilets

Green builders like composting toilets since they save a lot of water and the composting is inherently greener than rural septic systems or urban treatment plants. However, for sensitive people there may be problems with:

- odors
- mold
- noise (some models)
- EMF (some models)

Since composting toilets do not flush, they need to be cleaned daily to avoid smells. The composter stores months' worth of feces inside, where microbes (i.e. mold) digest them, which may be a mold risk.

Some models use electrical fans or heating elements, which may cause noise and EMF problems for some people.

Composting toilets are used by people with environmental sensitivities, but much thought needs to be put into choosing the right model, and the daily cleaning need must be considered.

Solar systems

Rooftop solar electric systems are universally considered to be green. However, the inverter that turns the DC electricity from the solar panels into something that can be sent out on the grid creates high levels of dirty electricity throughout the building. This can be a problem to some sensitive people (EIwellspring, 2019b).

There are healthy inverter-less DC-only solar systems, but they have limitations most people would find unacceptable.

Electronic energy saving devices

There are many energy saving devices available that are popular among the "green" building community, but are problematic for sensitive people because they create dirty electricity or wireless radiation. (EI Wellspring, 2019a) These include:

- smart meters
- low energy light bulbs (CFL, LED)
- variable-speed motors
- wireless smart thermostats and sensors
- automatic light dimmers

The variable-speed motors are used in some energy-efficient refrigerators, air conditioners, heat pumps and forced-air heating systems. The motors are basically controlled by an inverter.

The automatic light dimmers are used in some office buildings that also use natural lighting.

Earth tubes

A "green" idea that keeps popping up is to cool the house by pulling air in through long tubes buried in the yard. The soil is cool in the summer and air passing through the tubes will cool before entering the house. The fan uses a lot less electricity than an air conditioner.

The problem is that when air is cooled down, it becomes less able to contain moisture. The result is that water will condense on the inside of the tubes. Then we have a cool, moist and dark space that is a great breeding ground for mold — right in the airstream into the house. People have tried to "solve" the problem by coating the tubes with fungicides, but is that really such a great idea? (Riggins, 2012). Don't do this! Not even in the dry desert.

Earthships

Architect Mike Reynolds came up with an ingenious way to solve the problem of what to do with all the used automobile tires. His earthships have hundreds of tires embedded in their walls and covered with stucco. The ceilings are made of wooden logs, rainwater is collected and filtered. Indoor plants are encouraged. These earthships are beautiful houses in the style of the American Southwest (Reynolds, 1990).

Earthships are beautiful, but may have problems with mold and fumes from the tires embedded in the porous walls.

But to sensitive people, there are several problems. The many toxic tires in the walls are not sealed airtight, and they will emit low levels of fumes through the porous walls forever.

The houses are typically built into the side of a hill for energy efficiency, and have flat roofs. Along with the indoor garden, these are features that can eventually cause mold problems, even in a desert.

The wooden ceilings are also a problem for many sensitive people.

Green building certifications

Professor Anne Steinemann reports (Steinemann, 2016) that there are 55 different green certification schemes in more than 30 countries. What such a certification means for the indoor air quality varies.

Green certification schemes award points for many features that are unrelated to indoor air quality, and even some that are detrimental. Points may be given for using recycled materials, energy efficiencies and locating the building in polluted high-traffic areas (to save energy for commuting). Building products and maintenance materials that meet the requirements can contain problematic pollutants, such as fragrances, terpenes and essential oils.

Some schemes allow a building to obtain the highest green ranking without any measures to improve the indoor air quality at all. Other schemes do require basic minimum indoor air quality measures to qualify. However, the air quality issues still tend to drown in the list of features that are considered worthy of points (Steinemann, 2016; Wargo, 2010).

A study at Harvard University found that just 40% of new buildings certified by the LEED program got credit for enhanced ventilation (MacNaughton, 2015).

The ASHRAE engineering society in the United States state (2017):

> *All of these programs are well-intentioned, but for the most part are not based on thorough consideration of all the many parameters impacting [indoor air quality].*

There are also various certification programs for individual building products, such as carpets, paints and wall boards. They often claim to test for several chemicals, especially formaldehyde, but what about the many other possible chemicals they do not test for? And are their "acceptable" levels really low enough for someone hypersensitive? Also, how often do they test a specific product? If it is just once a year, they may not catch variations in the products. And is the manufacturer told in advance when the testing will happen?

It appears that green certifications are well intentioned, but insufficient to ensure a usable air quality for highly sensitive people.

Hiring a green builder

Any green builder who does not have direct experience in building specifically for people with severe environmental sensitivities will have a lot to learn. Whether he or she is willing to accept this is a personal matter. Some will be willing to take on the challenge, others not. Some will be insulted that their methods are not healthy for some people just as conventional builders can feel insulted. Green builders can be just as resistant as anybody else.

It is imperative to be sure that any builder is willing to learn what they need, and they fully understand the needs of the people they are building for. Be careful with people who are full of self-confidence and brush off these concerns as unimportant or “already taken care of.”

Green versus disability

In a world designed for able-bodied people, there have to be allowances for people with disabilities, even if that may conflict with green principles.

In a perfect green city, people walk or bicycle to work or school, or walk to the nearest wind-powered electric train. But not everybody can do that. For some people the choice is to use a private car or some sort of handicap van service – or not go anywhere at all.

Similarly, there are some people who can't live or work in some of the super-green buildings. It's really that simple.

More information

More articles about designing, building and renovating homes and buildings for people with environmental sensitivities are available on www.eiwellspring.org/saferhousing.html.

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