

# The Secrets to a Healthy Home



Photo © Darren Sellow

**"Harmony House—Opus II" features formaldehyde-free cabinetry and counters made from recycled paper, in addition to many other healthy building materials and techniques. Design by TFH Architects and Green Design Studio, construction by Symphony Construction.**

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**W**hat does it mean to live in a healthy house? Is a healthy house the same thing as a “green” house or an energy-efficient house? Not necessarily. A great deal of current “greening” advice reflects a desire to sell products rather than a focus on improving the health of the people who live in our homes and communities.

Health-conscious consumers scurry to purchase bamboo products, avoid toys from China, and use special soaps to scrub their vegetables. Unfortunately, they often miss the most critical factors that influence the healthfulness of their homes. Creating truly green and healthy housing requires

more than buying certain products. We need to change how we live, build, and maintain our homes. The good news for the educated consumer is that you can have a healthy and green house by focusing on factors that really affect your health. This article provides an overview of the most important factors, along with action items for improving your home without breaking the bank.

## **What Really Affects Health in Your Home?**

Lead is perhaps the best studied of all the environmental health toxins and is most specifically associated with housing. Lead paint was a “premium” product used in homes prior to 1950 (lead was still included at lower concentrations in paint formulations until it was banned in 1978). While

it is clear that the paint companies knew that the lead in paint was highly toxic, they could hide from culpability because lead poisoning didn’t show up until the paint degraded decades later. The majority of children were exposed not by directly eating lead paint, but through breathing and ingesting house dust and soil contaminated with degraded lead paint.

Despite the recent hype and concern about lead in toys, lead in dust and soil from deteriorated paint remains the most common cause of lead exposure for young children, with renovation and repair work accounting for close to one third of new cases. Unfortunately, lead-contaminated dust and soil are indistinguishable from regular house dust, and symptoms of lead poisoning are often invisible, even at levels that cause harm.

**ACTION:** *If you live in a home built before 1950, make sure there is no chipping or peeling paint. Consider testing for lead dust if you have young children. When doing repairs or renovations, minimize dust, contain the site, and clean up thoroughly.*

### **What Else Is in House Dust?**

Recent studies of household dust samples have turned up alarmingly high levels of pesticides. These pesticide residues are related to home and garden products used by homeowners and property management companies. A recent analysis done on New England home samples found that the most abundant pesticides were pyrethrins and the synergist piperonyl butoxide. This combination is most commonly found in spray pesticide used to kill insects.

Ironically, pesticide sprays do not reduce the likelihood of pests returning or reduce pest populations, because they fail to treat the underlying causes of pest entry into living spaces. Spraying exposes occupants to unnecessary toxins while reducing the effectiveness and attraction of targeted baits that are preferred pest-control methods.

Just as the effects of lead continue years after use of the product ended, other materials can produce a lingering, negative effect. For example, many building materials, especially upholstery and foams used in upholstered furniture, as well as household electronics (televisions, computers) contain chemical flame retardants. These are highly toxic compounds that have been found in household dust.

In addition, vinyl building products can expose occupants to another class of chemicals that are coming under increasing scrutiny: phthalates. Phthalates are chemicals that soften plastic. The State of California recently banned their use in children's toys. In addition, leading health care institutions are increasingly avoiding vinyl building products.

Another source of contaminants are gases from paints and finishes, and adhesives. Of greatest concern are volatile organic compounds (VOCs) and formal-



**Cellulose insulation is blown into an existing home.**

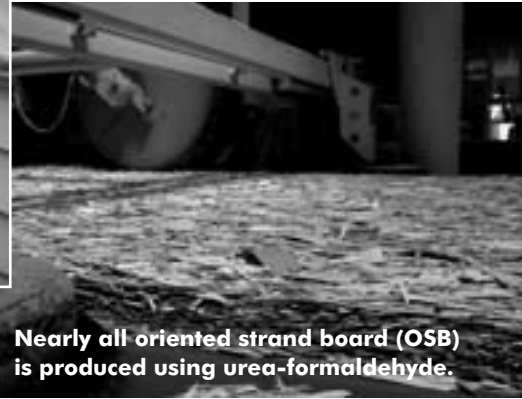
dehyde. Fortunately, manufacturers of paints, carpets, adhesives, and other interior finish materials have worked to reduce VOC emissions in their products. Low- or no-VOC paints and adhesives are increasingly easier to find.

The greatest use of formaldehyde-emitting materials is in sub-floors and kitchen and bathroom cabinets. Choosing exterior grade plywood, which uses a different adhesive formulation, and/or carefully sealing the particleboard or OSB to limit emissions will reduce formaldehyde in your home. We can expect low-emitting composite wood products to become increasingly available.

**ACTION:** *Don't use sprays. Avoid vinyl building materials and products that use flame retardants. Choose low-VOC paints and finishes. Check for low-VOC and formaldehyde choices in carpet and manufactured wood products.*

### **Environmental Tobacco Smoke Is More than a Personal Choice**

Little compares with tobacco smoke for undercutting health and introducing toxins into the home. Tobacco smoke releases many toxic gases and carcinogens, including carbon monoxide, hydrogen cyanide, and formaldehyde. Since all household occupants inhale the smoke, the home environment remains the number one source for exposing children to tobacco smoke. The health consequences of tobacco smoke include premature death and disease in children, a three-fold increase in risk for sudden infant death syndrome, acute respiratory infection, ear problems, and development and exacerbation of asthma.



**Nearly all oriented strand board (OSB) is produced using urea-formaldehyde.**

Smoking also remains the leading cause of fire-related deaths.

All research has concluded that there is no effective way to contain environmental tobacco smoke. Separating smokers and non-smokers doesn't work, and no air cleaners or ventilation systems or unit-sealing measures exist that effectively isolate smoke. The only truly effective method of protection is to make homes smoke-free. Multi-family properties that share building systems require an active, enforceable policy to become and stay smoke free.

**ACTION:** *Make your home smoke-free. If people must smoke, then smoke outside.*

### **Moisture, Another Hidden Danger**

Moisture plays a significant role in housing deterioration, leading to falls and injuries, and exacerbating problems like lead paint decay. Moisture's greatest threat is that it supports mold growth, dust mites, and other pests (mice, rats, cockroaches) that depend upon water to survive. Moisture in the home comes from outside sources such as rain or ground water, from showering and cooking, and from the condensation of humid air.

Building shells (foundation, walls, roof, windows, and doors) should be designed to shed and resist water. Locating a house away from wet areas, grading the property so water runs away from the home, and using overhangs and drains are all critical to minimizing water's contact with the house. Preventing soil moisture from entering the house requires the correct



**A moldy basement**

design of foundations and floor slabs, including installation of a vapor barrier.

A major source of water is plumbing leaks. Installing durable low-flow faucets, showers, and toilets can help minimize this source of moisture. Checking for and fixing leaks, even small ones, is critical. Kitchens and bathrooms need ventilation systems such as range hoods and bathroom fans that exhaust to the exterior. Effective, quiet bathroom fans are reasonably priced and can be combined with humidistats (moisture sensors).

As fans operate to exhaust humid air, they bring new air into the house. This requires that we actively protect against moist air getting trapped in wall or ceiling cavities where it degrades insulation and structural integrity, and breeds mold and bacteria. The core to blocking air leakage is air sealing. It is not always easy to provide air sealing, especially in existing construction. That means it is particularly critical to provide air sealing in original construction and during renovations when walls are open. To complete the water-resistant enclosure, select doors and windows that are watertight and resist condensation.

In humid summer months, cold water

pipes provide a cool surface for condensation. Insulating pipes can prevent this. Similarly, toilet tanks can act as a cold surface for condensation. Use of a bathroom fan may help, but if condensation is a problem, then providing a moisture-resistant surface on walls and floors is critical. Low flush toilets and pressure-assist toilets decrease the cooling water available to create the “cool surface.”

**ACTION:** *Stop water leaking into the house from precipitation and ground water. Control the water generated in the home. Use bath and kitchen fans vented to the outdoors.*

### **Radon**

If you are in a high radon risk area (much of New England is), you can install a passive radon system during construction of the foundation. These systems are inexpensive (under \$100) and can be made active should further testing show a radon problem. Retrofitting a radon exhausting system can cost several thousand dollars. Radon is a naturally occurring radioactive gas that is heavy and concentrates in lower levels of homes. It can cause cancer with continued exposure.

**ACTION:** *Build in inexpensive radon venting systems in new construction. Test existing homes for radon.*

### **Combustion Gases**

Any time fuels (natural gas, propane, oil, coal, kerosene, and wood) are burned, combustion gases—carbon monoxide, nitrogen oxides, and carbon dioxide—are produced. Carbon monoxide and nitrogen oxides are of greatest concern. Carbon monoxide (CO) is often understood as the gas that kills people who turn on their cars in an enclosed garage. But while you can smell car exhaust, carbon monoxide itself has no smell, taste, or color. Carbon monoxide causes harm at low levels, where non-specific symptoms such as fatigue and headache or even the lack of symptoms may lead to ongoing exposure and health effects without people’s knowledge. Similarly, nitrogen oxides (NOx) are known,

even at low concentrations, to burn and scar lung tissue.

A significant source of CO and NOx is unvented heating appliances. These should never be used. Gas cooking stoves must be used with a range hood. Heating equipment and other appliances such as dryers can also leak combustion gases, as can chimneys and furnaces. Equipment should be regularly maintained and checked for leaks. It is important to have carbon monoxide detectors for notification when CO levels rise.

### **Chimneys and Backdrafting**

The chimney effect is, in its simplest form, the fact that hot air rises. When a fire is made in a fireplace or woodstove, the warm air rises up the chimney and draws cooler air in from the room. A draft is created continuing to pull air up the chimney. The chimney effect, however, can be overcome when a house is depressurized. This happens when the chimney must work against the suction created by other exhaust devices, such as range hoods and house exhaust fans. Air is pulled down the chimney, and, with it, come combustion gases. Properly sized exhaust fans should not, under normal operation, cause this phenomenon. However, oversized or “professional” range hoods can be a problem. Running multiple exhausts at once, such as the dryer vent and the range hood, and lighting the wood stove can similarly create a depressurization.

In extremely tight houses, there is less ability for replacement air to come in, so planning for air and exhaust is critical. Using sealed combustion systems, where dedicated air is provided for combustion and gases are exhausted without any household air being intermingled, can eliminate much of the problem. For appliances where this is not possible, power venting should be employed (i.e. use of a fan to push gases up the chimney or out the wall vent) so that the chimney can overcome any depressurization. It should be noted that open burning fireplaces contribute significant pollution to the house and, regardless of drafting, are not part of a “healthy home.” Efficient modern woodstoves can be suc-

cessfully designed into homes. In very tight houses, masonry heaters may be a more appropriate choice if wood fuel use is strongly desired.

**ACTION:** *Install carbon monoxide detectors. Never use combustion equipment that is unvented or vent free. Do not use heaters or other fueled appliances in spaces without clear ventilation. Choose sealed combustion appliances when possible. Ensure all combustion equipment has clear working exhaust systems. Maintain all combustion equipment and check for leaks.*

### Insulating and Air Sealing Are the Best Bang for the Buck

When we look at what is most influential to the quality of indoor air, well-insulated, air-sealed homes with planned mechanical ventilation become the clear first investment choice. In the Northeast, where most of our energy cost is related to winter heating and summer cooling, this investment has a tremendous pay-off, not just

for our health, but directly to our comfort and our pocketbooks. It is also perhaps the best contribution we can make to the environment. By reducing our use of fossil fuels, we reduce pollution related to their extraction and combustion as well as reduce greenhouse gas contribution. The well-designed tight house also helps reduce pests and, one hopes, pesticides—another win for health and the environment. Finally, the investment in durable water-saving devices and attention to leaks reduces the draw on our water system and wastewater treatment.

A green and healthy house is within reach for most of us, but we should not forget the lessons of lead poisoning—that what we bring into the home and how we live in the home act synergistically to create environments that affect our health. We should focus less on what cool, new products to buy and more on not bringing in hazardous materials and designing tight, energy-efficient buildings that shed water and maintain comfort.

There may even be enough savings to help pay for that solar hot tub of our dreams.

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