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HEALTHY HOUSE



REPORTS

THE UNHEALTHY HOUSE • NO. 101

Many scientific studies have documented the fact that the quality of the air in our houses is deplorable. Often, as we go indoors, we enter an atmosphere that is considerably more polluted than the outdoors. There are a variety of reasons for this. One of the primary causes of indoor air pollution is the fact that our homes are filled with synthetic materials that outgas a wide range of chemicals into the air.

One study identified over 200 odorous compounds emitted from building materials. Typical examples are: acetonitrile, methyl methacrylate, styrene, aliphatic hydrocarbons, ketones, alkenes, and esters. Some of these chemicals are carcinogens (vinyl chloride, trichloroethylene, benzene), some are sensitizers (formaldehyde, toluene di-isocyanate), and some plasticizers cause chromosomal damage. Unfortunately, most of the chemicals found in the air of our homes have not been studied for their precise health effects. When these chemicals are released into the air, usually they cannot escape to the outdoors because of the tightness of many modern houses.

Walking into the average house can sometimes be compared to placing your head inside a plastic bag that is filled with toxic fumes. It is no wonder that thousands of people are suffering from various building related illnesses. For many of the people that are being made sick by their house, some major changes are necessary before they can regain their health. For a few people a healthy house is necessary for survival. For the rest of us, a non-toxic house will help us to maintain optimal health.

Can anything be done to make houses healthier? Yes, there are some principles to keep in mind when building or remodeling that will help to considerably reduce the levels of pollutants in the indoor air. The three most

important concepts to remember are **Elimination, Separation, and Ventilation.**

Elimination is by far the most important principle to use when selecting building materials. If you eliminate toxic materials in the construction of a house, there will be no toxic gases to contend with. Probably the worst offenders are carpeting, man-made wood products and some heating systems. Unfortunately, these potentially polluting components are almost taken for granted in house construction today.

Often, most products are chosen over less polluting alternatives primarily for economic reasons. It is usually not considered that if ill health is the result of using toxic materials, the money saved could go toward medical expenses. Saving a few hundred dollars on construction materials can quickly be spent at the doctor. If cancer is the result, medical bills can easily exceed the cost of the entire house. It makes economic sense to spend a little more on healthful materials in order to spend less on health care.

New carpeting has been shown to outgas dozens of chemicals that can and do affect health. Examples include formaldehyde, xylene, ethylbenzene and methacrylic acid. While the outgassing decreases with aging, the synthetic fibers can continue to break off, contributing to house dust. This isn't just ordinary house dust, it is synthetic house dust. When it finds its way into the heating system, it burns and releases small amounts of such undesirable gases as phosgene and hydrogen cyanide into the air.

New carpeting often is treated with fungicides or other chemicals to kill the molds and dust mites living there. These chemicals are designed to kill living creatures. Since we too are living creatures, these chemicals can negatively affect us as well. As the treatments are removed over the

years by shampooing, the tiny creatures begin to thrive. Studies have shown that there can be millions of microorganisms per square foot residing in carpeting. Not a very appealing thought. Of course, some of the bacteria will be relatively innocuous but mold spores and dust mites are common sources of allergic and asthmatic reactions. Carpeting can also be a home for various pathogenic organisms if they happen to be in the air.

Manufactured wood products are to be avoided primarily because of their formaldehyde emissions. The medium density fiberboard used in cabinetry and for closet shelving will result in occupants being exposed to very high levels of formaldehyde. In fact, the only time the average person will be exposed to higher levels is after death, during the embalming process. Plywood and flakeboard products are somewhat less offensive, but there are many people who exhibit symptoms when exposed to their lower levels of formaldehyde. There are even sensitive individuals who cannot tolerate hardboard, with its very low levels.

Formaldehyde is not only an eye, respiratory and skin irritant, it is also a potential human carcinogen. It can induce asthmatic attacks and depress the central nervous system. According to an article in the *Journal of the American Medical Association*, 4% to 8% of the population could become sensitized to formaldehyde. Once sensitized, they could experience more severe and prolonged reactions to smaller and smaller exposures. 4% of the American population is about 10 million people. A member of your family could easily be one of those affected.

While no longer used in the construction industry, there are millions of houses contaminated with materials like lead and asbestos. In fact, it has been estimated that 74% of all houses built prior to 1980 contain some lead paint. Some people consider lead to be the number one environmental threat to children in this country, resulting in slowed development, lowered I.Q., and hyperactivity. Consequences of breathing asbestos fibers include respiratory disease and lung cancer.

Radon doesn't discriminate. It can be a problem in either new or old houses. The Environmental Protection Agency has estimated that radon may be responsible for up to 20,000 lung cancer deaths a year.

Heating systems fueled by wood, natural gas, oil

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The Healthy House Institute.

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responsible for up to 20,000 lung cancer deaths a year.

Heating systems fueled by wood, natural gas, oil and kerosene have the ability to pollute the house with combustion gases and particulate matter. Anything with an open flame should be banned from a healthy house, including candles and cigarettes. The major by-products of combustion (nitrogen oxide, nitrogen dioxide, carbon monoxide) are well known indoor air pollutants to which many people are exhibiting reactions ranging from flu-like symptoms to death.

With immature immune systems, children are often the most susceptible family members to indoor pollution. It has been shown that children living in homes with wood stoves have a significantly increased chance of developing respiratory symptoms. Unborn babies are also at risk as are pregnant women and the elderly. The outdoor air pollution in areas where wood burning is common attests to the fact that in many cases wood is not a very clean-burning fuel.

Hopefully, we have progressed beyond the level of cavemen sitting around a fire. A fire outdoors is polluting enough, and there is no good reason to bring it indoors. In Scandinavia, it is common to locate a natural gas furnace outside the house in order to avoid polluting the living space.

Combustion by-products are a problem in houses because many heating systems have been found to be backdrafting. When this occurs, the combustion gases travel down the chimney, rather than up, and become part of the air breathed by the occupants.

There are many potential pollution sources in our homes, but carpeting, man-made wood products, and combustion gases are among the most common in

new construction. For very sensitive people, everything in the house should be suspect, and should be tested prior to using indoors.

Most of the treated lumber being used for decks and playground equipment is treated with toxic arsenic containing compounds to preserve it from mold and insect attack. Other more poisonous chemicals are used to treat houses in order to render them termite resistant. Many people have had their health permanently damaged by these products.

The kitchen and bathroom are the most complicated rooms in the house because of their fixtures, cabinets and appliances. Most commercially produced cabinetry contains a considerable amount of particle board or plywood. Since much of the water in this country is polluted, a filtration system is often desirable.

After analyzing the many components of a house, it will quickly become apparent that there are some things that can't possibly be eliminated. For these items, the second principle of Separation is important. The idea is to separate the offending substances from the living environment. For example, the insulation can often be effectively sealed from the living space by using foil-backed drywall.

Paints and sealants can sometimes be used to seal problematic wallboard or wood trim in order to separate them from the air that we breathe. However, sealants must be carefully chosen in order not to be a problem themselves since many commercially produced products contain toxic compounds. If construction methods are carefully planned, many offending substances can successfully be separated from the living space with either metal foil or an appropriate sealant.

CATEGORIES OF INDOOR POLLUTANTS

•BIOLOGICALS

Dust mites, mold spores, mildew, pollen, animal dander, bacteria, viruses.

•GASES

Formaldehyde, combustion by-products, volatile organic compounds.

•METALS

Lead paint, arsenic in treated lumber.

•MINERALS

Asbestos, fiberglass insulation, airborne calcium particles from humidifiers.

•RADIATION

Radon, electromagnetic fields, radioactive material in some smoke detectors and compact fluorescent lights.

•VAPORS

Mercury vapor from biocides in paints. Excess water vapor can cause an increase in biologicals and outgassing of formaldehyde.

Last, but by no means least, the principle of **Ventilation** should be considered. To rely on infiltration to supply fresh air in today's tightly built houses is foolish. It may be a sufficient source of fresh air on a windy day but less than adequate on a calm day. Since we are living creatures, we constantly need fresh air to breathe. Our bodies aren't content to wait several days for the infiltration rate to pick up in order to get fresh air. Ventilation is also needed to remove moisture from houses in order to reduce the chances of mold and mildew contamination.

While it is not yet routinely done, all modern houses should have mechanically supplied fresh air. The tighter the house, the more important this requirement. Typical construction methods mean that all of the houses being built today should have some form of controlled ventilation. Building with sheet goods, like drywall, means that there are fewer cracks for fresh air to enter a house. Windows are considerably tighter today than those built in our grand-parent's era.

The result is that infiltration shouldn't be relied on to supply fresh air to a house. It simply isn't sufficient on most days and it cannot be controlled.

An extremely tight house can be desirable from a health standpoint. But by reducing uncontrolled infiltration to an absolute minimum, ventilation becomes extremely important. This is advantageous to health, in that ventilation can be controlled. It can be turned on and off by the occupants. It can also be filtered. By using a variety of filter types, all of the air entering the house can be cleaned. Occasionally, there will be something occurring outdoors that would overload the filtering system. A neighbor applying lawn or garden chemicals or burning trash are typical examples.

If there is an outdoor pollution alert, the air supply can be temporarily shut off. Since we can't eliminate many of the outdoor pollution problems, controlled, filtered ventilation is the only way to insure that the air we bring indoors to breathe is clean. Of course, the ventilation system should never be shut off for long periods of time in a tightly built house. Human beings give off

various pollutants as by-products of metabolism such as acetaldehyde, carbon dioxide, carbon monoxide and methane. These can build up, while at the same time oxygen is consumed. As a result, a tight house with the ventilation system shut off for several days can have high levels of pollutants.

Although many pollution sources can be **Eliminated**, and others can be **Separated** from the living space, **Ventilation** is still of great importance. By combining all three principles in new construction or remodeling, a healthy house can be the result. However, it must be remembered that many occupant related activities can easily contaminate the air in a house that

otherwise has clean air. For example, applying pesticides, cooking, and some hobbies can require additional ventilation or filtration. Also, manufactured wood products that give off formaldehyde are often used in furniture, and many cleaning products are considered household hazardous waste. Fortunately, there are less toxic alternatives today for virtually everything that is found indoors.

Healthy houses may not yet be the norm but they certainly are possible. In fact, they are no more difficult to build than unhealthy ones. It just takes an understanding of the problem and proper selection of materials and techniques. Your house should be a healthy one because you and your family deserve it.

POSSIBLE NEGATIVE HEALTH EFFECTS OF INDOOR POLLUTION

Irritation of eyes, nose, throat, or respiratory tract. Dry mucous membranes, nosebleeds. Headaches, dizziness, disorientation, lack of coordination, fuzzy thinking, blurred vision. Asthma, breathing difficulties, shortness of breath, hoarseness. Fatigue, loss of sleep, drowsiness. Nausea, loss of appetite. Multiple chemical sensitivities. Central nervous system damage. Nervousness, depression, anxiety, mental retardation, hyperactivity. Irritability, memory or communication problems, difficulty thinking. Abdominal pain. Kidney or liver damage. Cancer, birth defects, chromosomal damage. Allergies, hives, rashes, skin irritation. Coughing, congestion, pneumonia. Fever, flu-like symptoms. Menstrual irregularities. Joint pain, muscle weakness, loss of muscle control. Rapid or irregular heartbeat. Death.