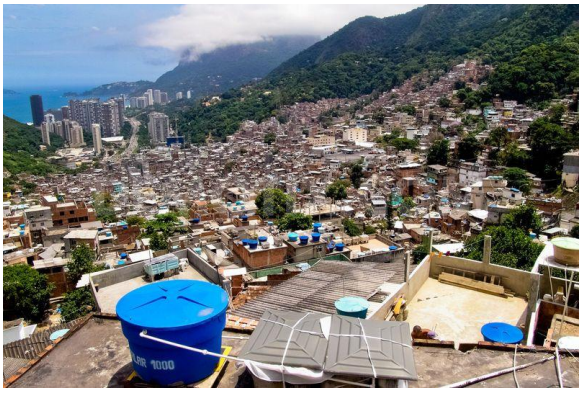
Material Health in the Built Environment

"When you can't breathe, nothing else matters"

There is substantial evidence to indicate that a proportion of construction materials are potentially hazardous to health and deleterious to the environment. They continue to be used for lack of evidence of their toxicity.

All materials exist on an environmental impact continuum of varying positive and negative impacts on human health and the environment. A wide range of environmental health policies of local and national governments and international treaty have identified certain chemicals as warranting priority efforts to eliminate due to their high toxicity and global impact.

The building sector should make an effort to move away from materials that incorporate these high priority "worst in class" chemicals or lead to their release in the materials' life cycle toward alternatives that we understand to be safer.

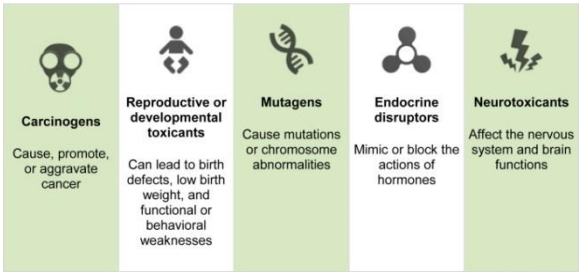


This article is aimed at creating transparency into building materials containing substances that are publically known or suspected to be associated with an adverse finding in relation to human and

environmental health. With the intention to increase awareness about harmful chemicals in everyday materials and to reduce people's everyday exposure to toxins, RWpl has put together a list to encourage the building product marketplace to become more transparent from extraction to end of life for all points of contact, from manufacturers to de-constructors, so that people are further

empowered to make informed decisions about specifying, maintaining and disposing of the products in their buildings.

Toxic substances come in different forms and have different health effects. But 5 classes of chemicals rate a high across-the-board priority for green building decisions:



Carcinogens include Arsenic, Cadmium, Chlorinated Polyethylene (CPE), Chlorinated Polyvinyl Chloride (CPVC), Chloroprene (2-chlor-1,3-butadiene), Chlorosulfonated Polyethylene (CSPE), Creosote Hexavalent Chromium (VI), Lead, Pentachlorophenol, Phthalates, Polyvinyl Chloride (PVC), Urea-formaldehyde and Volatile Organic Compounds (VOCs).

Reproductive or Developmental Toxicants include Arsenic, Cadmium, Chlorinated Polyethylene (CPE), Chlorinated Polyvinyl Chloride (CPVC), , Chlorosulfonated Polyethylene (CSPE), Copper (for exterior material), Lead, Mecury, Pentachlorophenol, Phthalates, Polyvinyl Chloride (PVC), Urea-formaldehyde and Volatile Organic Compounds (VOCs), Bisphenol A (BPA) and Organostannic Compounds

Endocrine Disruptors include Arsenic, Bisphenol A (BPA), Cadmium, Chlorinated Polyethylene (CPE), Chlorinated Polyvinyl Chloride (CPVC), Chlorosulfonated Polyethylene (CSPE), Lead, Mercury, Pentachlorophenol, Phthalates, Polyvinyl Chloride (PVC).

Neurotoxicants include Arsenic, Bisphenol A (BPA), Bromochlorodifluoromethane, Chlorinated Polyethylene (CPE), Chlorinated Polyvinyl Chloride (CPVC), Chlorofluorocarbons (CFC), Chlorosulfonated Polyethylene (CSPE), Creosote, Hydrochlorofluorocarbons (HCFC), Lead Mercury, Pentachlorophenol, Polyurethane Foam, Polyvinyl Chloride (PVC) and Urea-Formaldehyde

Other classes include **Cardiovascular or Blood Toxicant, Gastrointestinal or Liver Toxicant, Immunotoxicant, Kidney Toxicant, Respiratory Toxicant and Skin or Sense Organ Toxicant**

Potential Chemicals found in Common Building Materials

Asbestos

Asbestos fibers are strong, heat resistant, chemical resistant, and useful in providing heat insulation. Therefore, their most common uses include floor and ceiling tiles, plasters, insulations, adhesives, wallboard, roofing materials, fireproofing materials, and cement products.

Asbestos is a known **carcinogen**, and inhalation of asbestos fibers is known to cause respiratory problems and lung diseases such as Asbestosis, Mesothelioma, and Lung cancer. All three of these diseases experience delayed development and the diseases may **not** manifest for 10-40 years after the initial asbestos exposure.

However, asbestos that is intact, undisturbed, and in overall good condition does not necessarily pose a problem to human health, but deterioration and

damage releases fibers into the air. A professional is needed to remove or repair asbestos-containing materials that are damaged or will be disturbed during an improvement project.

Asbestos use in Sri Lanka is **LEGAL** despite the many health hazards associated with it. Not only that, all western countries that have banned Asbestos use in any domestic product has no objections to exporting to poor countries such as Sri Lanka and India.

There are many forms of asbestos, with blue asbestos already banned in Sri Lanka since 1997. But white asbestos (chrysotile asbestos) made by mixing asbestos fibre with cement, continues to be used mainly as roofing sheets. However, a WHO study reveals that all forms pose a health hazard. According to a WHO analysis, more than 107,000 people die each year from asbestos-related lung cancer, mesothelioma and asbestosis, resulting mainly from occupational exposure.

Asbestos factory workers, carpenters who work on roofing projects, laborers of asbestos stores facilities and workers at building demolishing sites are in the high risk categories. Workers should be advised to use protective equipment, especially when cutting asbestos related materials, which releases lots of dust containing asbestos fibre.

The University of Moratuwa Sri Lanka has attempted to analyze Sri Lanka's Cancer Registry, to evaluate a link with occupational related cancer. Around 18,000 are annually diagnosed with cancer in Sri Lanka, but collection of data relating to occupations of the cancer patients has been a difficult task. It can take about 20-30 years for the real cancer to emerge, which makes it harder to track its root causes.

Sri Lanka has three main asbestos roofing sheet manufacturing companies and are said to be using precautions to safeguard their employees. However, it is important that the authorities constantly monitor the situation, as these employees can be in the line of direct exposure. Concentration of asbestos fibers in the air, duration of the exposure, frequency of exposure and the size of the asbestos fibers inhaled are some of the factors to which the seriousness of the asbestos related health risks is subject to. Carpenters working on roofs are also highly exposed to asbestos related health hazards. Most individual carpenters working on their own, are ignorant of such a danger, and just cut the asbestos, even without covering their noses, exposing themselves to high danger levels, where experts advise using 100% body cover when exposed to asbestos.

Asbestos debris should also be disposed of with extreme care. There are guidelines for waste generated by asbestos manufacturing plants, but many of the household asbestos is being disposed of irresponsibly. According to the guidelines, these have to be buried much deeper in the earth. The 2004 tsunami was a good example, where a large number of houses with asbestos sheets were destroyed and disposed of at normal dumping grounds in Sri Lanka's coastal belts.

Asbestos in Sri Lanka cannot be **banned** immediately, until we find a suitable alternative" said Environment Minister Anura Priyadarshana Yapa. But awareness is

the key to minimize asbestos related health hazards.

It may be useful to read the report on 'Health Hazardous from Asbestos Contamination' by the Central Environmental Authority of Sri Lanka.
https://www.google.lk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&ved=0CCgQFjAA&url=http%3A%2F%2Fcea.srilankahealthrepository.org%2Fbitstream%2F123456789%2F90%2F1%2FAsbestos%2520Contamination.doc&ei=bK0pUs-TOebpiAfX1oDYCw&usg=AFQjCNE03q1nzaVUxGyfZsreQJuJV0J0FQ&bvm=bv.51773540,d.aGc

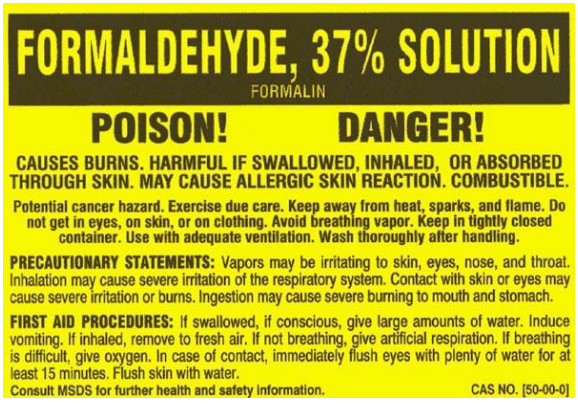
Chromated Copper Arsenate (CCA) in pressure treated wood

CCA is a pesticide/preservative used to prevent rotting in timber designed for outdoor use. CCA contains arsenic, chromium, and copper and is widely used for residential purposes. CCA-treated wood can be found virtually anywhere outdoor timber is used, such as play sets, decks, and picnic tables.

CCA-treated wood can be hazardous to human health because arsenic is a known **carcinogen**. Exposure to arsenic can cause cancer of the lung, bladder, skin, kidney, prostate, and nasal passage. Arsenic exposure can also lead to nerve damage, dizziness, and numbness. Arsenic can leach to the surface of the treated wood, becoming accessible for absorption through exposed hands and skin touching the wood surface and, especially in the case of children, ingestion through normal hand-to-mouth behavior. Arsenic can also leach into the ground surrounding the location of the treated wood.

Formaldehyde

Formaldehyde is used widely to manufacture building materials and numerous household products. It is also a by-product of combustion and certain other natural processes. Thus, it may be present in substantial concentrations both indoors and outdoors. In homes, the most significant sources of formaldehyde are likely to be pressed wood products made using adhesives that contain urea-formaldehyde (UF) resins. Pressed wood products made for indoor use include particleboard, hardwood plywood paneling, and medium density fiberboard, which contains a higher resin-to-wood ratio than any other UF pressed wood product and is generally recognized as being the highest formaldehyde-emitting pressed wood product.



Formaldehyde is present in significant quantities in a wide range of house furniture, insulation and floor and wall fittings. It is used in hundreds of industrial processes including the manufacture of particle boards, MDF, chipboard and plywood, thermal insulation foams, adhesives, glues and resins.

Chipboard is a ubiquitous construction material. It is usually bonded together with Phenol Formaldehyde resin. In addition it is sometimes treated with preservatives of a type banned in the USA

Formaldehyde is also used to add permanent-press qualities to clothing and draperies, as a component of glues and adhesives, and as a preservative in some paints and coating products. Formaldehyde, a colorless, pungent-smelling gas, is a known respiratory irritant and **carcinogen**. It can cause watery eyes, burning sensations in the eyes and throat, nausea, and difficulty in breathing in some humans exposed at elevated levels (above 0.1 parts per million).

Perfluorinated Compounds (PFCs)

PFCs are a family of fluorine-containing chemicals with unique properties to make materials stain and stick resistant. Although these chemicals have been used since the 1950s in countless products, they've been subjected to little government testing.

There are many form of PFCs, but the two most notorious are:

- PFOA or perfluorooctanoic acid, used to make Teflon products. PFOA is broadly toxic. It does not break down in the environment and has a half-life in the body of more than four years. PFOA is a likely human carcinogen; it causes liver, pancreatic, testicular, and mammary gland tumors in laboratory animals.
- PFOS or perfluorooctanesulfonate, a breakdown product of chemicals, was used until 2002 in the manufacture of 3M's Scotchgard treatment, used on carpet, furniture, and clothing. PFOS causes liver and thyroid cancer in rats. PFOS's half-life is estimated at more than 8 years.

Phthalates

Phthalates, called "plasticizers," are a group of industrial chemicals used to make plastics like polyvinyl chloride (PVC) more flexible or resilient. Building materials are the largest end use for PVC. Major uses of flexible PVC in buildings include carpet backing, resilient flooring, wall coverings, acoustical ceiling surfaces, upholstery textiles, roof membranes, waterproofing membranes, and electrical cord insulation. Phthalates can also be found in shower curtains, vinyl flooring, adhesives, and detergents. Certain phthalates are known or suspected endocrine disruptors, meaning they impact and alter the human hormone

system. Phthalates are also suspected to be potent reproductive toxins, especially in boys.

Often marketed on the basis of being easy to clean, Vinyl floors emit phthalates.

Polybrominateddiphenyl Ethers (PBDEs)

PBDEs are used as flame retardants in plastic building materials and are particularly widespread in polyurethane foam products (insulation and cushions). Key routes of human exposure are thought to be from their use in household consumer products, and their presence in house dust, and not from dietary routes. PBDEs have been associated in animal studies with liver toxicity, thyroid toxicity, developmental and reproductive toxicity, and developmental neurotoxicity.

Short-Chain Chlorinated Paraffins (SCCPs)

SCCPs' primary use is as a lubricant and coolant in metal cutting and metal forming operations – so they may be present in the life-cycle of metal building products. The second most significant use is as a secondary plasticizer in PVC in many of the same applications as the phthalate plasticizers listed above. To a lesser extent it is also used in other plastics, including acrylonitrile-butadiene-styrene resins (ABS), unsaturated polyester resins, polyethylene, polypropylene, and urethane foam for rubbers, paints, adhesives, caulks, and sealants as either plasticizers or flame retardants. Although no studies have been completed on humans, SCCPs are classified as toxic to aquatic organisms, and carcinogenic to rats and mice.

Plastics

All of the petrochemical-based materials in use today share a common legacy of emitting toxic chemicals in the process of refining the oil or gas from which these plastics are made. Chlorinated plastics, including polyvinyl chloride, however, have come under more intense scrutiny due to the extreme toxicity of chemicals involved in their production and disposal.

Polyvinyl chloride (PVC) commonly referred to as vinyl 3, is the most widely used chlorinated plastic polymer. The building industry is responsible for more than 75% of that PVC use. To make PVC flexible and versatile, the plastics industry can add a soup of chemicals to PVC, many of which raise concerns for human health and the environment. The health care industry has targeted PVC and other chlorinated plastics for elimination due primarily to a family of chemicals of concern uniquely associated with chlorinated plastics: dioxins. Dioxins are created during the production/ manufacturing process and when chlorinated plastics are burned accidentally or intentionally during disposal.

PVC Pipe routinely used inside and out

Throughout the lifecycle of PVC and other chlorinated plastics, through manufacture and disposal, the chlorine content has the potential to produce dioxins. Dioxins are an unavoidable by-product of the manufacture, combustion, and disposal of materials containing chlorine, which can create dioxins both when the products are manufactured and when they burn in structural fires or at the end of their useful life in incinerators or landfill fires. Dioxins include some of the most potent carcinogens known to humankind.

One of the most toxic dioxin compounds is not only a carcinogen, but also a **reproductive and developmental toxicant** and alters the immune and endocrine systems. Dioxins are a family of compounds widely recognized as persistent bioaccumulative toxicants (PBTs), which has led to them becoming a global problem. Dioxins are one of only 12 chemicals or families of chemicals targeted for elimination targeted by the intern- national treaty. The US Green Building Council has acknowledged that the chlorine content of PVC building materials and the resultant dioxin emissions puts PVC consistently among the worst materials for human health impacts.

Because PVC is inherently rigid, it requires the addition of plasticizers or softeners, known as phthalates, to provide it with some flexibility. Phthalates are semi volatile organic compounds that have come under increased scrutiny because of their potential effects on the reproductive, respiratory, and endocrine systems. Moreover, PVC often requires added stabilizers, including the heavy metal lead, which is also a human health concern.

In healthcare buildings, PVC is used in resilient flooring, ceiling tiles coatings, carpet backing, pipes and conduit, siding, window treatments, furniture, wall and corner guards, wiring and cable sheathing, wall covering and upholstery fabric. It is also used in medical devices including IV tubing, blood bags, and catheters.

In addition to polyvinyl chloride (PVC), the building industry uses a handful of other chlorinated plastics. Chlorinated polyvinyl chloride (CPVC) is a form of PVC with extra chlorine, often used for pipes. Polychloroprene (otherwise known as chloroprene rubber or neoprene) is found in geomembranes, weather stripping, expansion joint filler, water sealers, and other gaskets and adhesives. While most polyethylenes do not contain chlorine, two that do contain chlorine are chlorinated polyethylene and chlorosulfinated polyethylene. These two chlorinated polyethylenes are used to make geomembranes, wire and cable jacketing, roof membranes, and electrical connectors.

Persistent Bioaccumulative Toxicants

Persistent Bioaccumulative Toxicants (PBTs) include some of the chemicals that researchers have been studying for years (e.g., dioxins and heavy metals), as well as chemicals that science has only recently turned its attention to (e.g. perfluorochemicals). PBTs are of concern to human health and the environment because they are "persistent," which means that they do not break down rapidly in the environment and can last for months, even years, and sometimes decades.

Once emitted, PBTs can travel long distances through the atmosphere, the air and water, finally depositing sometimes far from where they originally were manufactured. In addition to being persistent, PBTs bioaccumulate; they build up in living organisms via air, soil, water and food. Many PBTs are stored in fatty tissue, increasing their concentrations by orders of magnitude as they move up the food chain to humans at the top, becoming most concentrated in mothers' milk, where they are readily available to breastfeeding infants.

Lastly, but clearly of great concern to humans, is the fact that PBTs are toxic. They include some of the most potent carcinogens, mutagens and reproductive toxicants known to science. Because PBTs are released into the environment and take so long to break down and disappear, dramatically high levels of these toxicants are found in wildlife and humans long after their exposure. For example, PCBs have been banned in the United States since the 1970s, yet their persistence has been so great that detectable levels of PCBs still remain in humans more than 30 years later.

Polyurethane

Polyurethane is generally considered one of the least preferable of the primary alternatives currently in use to replace chlorinated plastics. Thermoplastic polyurethane (TPU) is made up of polyols and diisocyanates. Diisocyanates are severe bronchial irritants and asthmagens associated with chronic exposures that can be fatal at high exposures for sensitive individuals. TPU is made from a variety of highly hazardous intermediary chemicals, including formaldehyde (a known carcinogen18) and phosgene (a highly lethal gas used as a poison gas in World War I that, in turn, uses chlorine gas as an intermediary). In combustion, polyurethanes emit hydrogen cyanide and carbon monoxide.

Polyurethane can be found in a wide array of building materials, including rigid foam (board and sprayed insulation, flexible foam (padding for furniture and bedding), coatings and paints, adhesives, sealants and elastomers (such as wood sealers and caulks), window treatments, resin flooring, gaskets and other thermoplastics, and fabrics. In the analysis of plastics used in health care, polyurethane may be more preferable than PVC on the spectrum, but is still more problematic than other plastics, including polyethylene (non-chlorinated types), polypropylene, and thermoplastic polyolefins. Research and development dollars invested toward sustainably grown bioplastics are even more promising because they move us away from our overreliance on petrochemical plastics.

Lead

LEAD is recognized as a prime toxic and lead poisoning is the most common among all the heavy metal pollutions. One of the major sources of exposure to Lead is Lead-based paints. Lead is added to paints (decorative and industrial paints) to speed up drying, increase durability, retain a fresh appearance, and resist moisture that causes corrosion.

Lead categories in paints:

White Lead (Lead Carbonate) has high affinity for vehicle paints; **Red Lead** (a Lead Oxide with orange in color) and **Blue Lead** (Lead Sulphate with Lead Oxide, Zinc Oxide, and Carbon) are used industrially where corrosion protection and color on metal is needed. Lead chromates are used to produce yellow, orange, red, and green paints. Litharge is a yellow pigment lead often used in glass or earthenware.

According to the Sri Lanka Standards Institution (SLSI) regulations, permissible level of Lead in paints:

Emulsion paints: Lead free
Enamel paints: 600 ppm

According to a new scientific research carried out by Toxics Link, CEJ and other environmental organizations in 10 countries, paints produced in Sri Lanka still have a very high Lead content in both enamel and emulsion paints. Some enamel paint samples tested contain as high as 137,325 ppm of Lead.

We're learning that lead exposure at even lower rates than previously known has negative effects in the form of cancer, and developmental and reproductive toxicity. You can still buy faucets and lead-containing solder to be used for potable water. In fact, in the US, even "lead-free" solder and flux is allowed to contain lead! So you have to specify "100% lead-free" if you're serious about eliminating lead.

Permitted level: Normal Blood Lead Level (BLL) is zero. Children are highly sensitive to Lead. Children expose to more than 10µg/dl will have health problems. Even low level and long term exposure can cause health hazards.

Lead is more dangerous to children and it affects the central nervous system and the poisoning affects are irreversible. It causes permanent brain damage in 70-80% of children even though they receive the best treatment.

The fact that Lead is still a health hazard in Sri Lanka it is important to consider lead poisoning as a differential diagnosis in children with a similar presentation. It is vital to introduce stern legal measures to limit lead in consumer products.

http://www.sljol.info/index.php/SLJCH/article/view/698/676

Mercury

There is still mercury in some electronics and thermostats, but the most significant source in the residential sector is in lighting. Since the massive rollout of Compact Fluorescent Lights (CFLs), several organizations have published clean-up protocols for broken CFLs. Mercury is a

known developmental toxicant, and it's suspected of many other health effects.

Volatile Organic Compounds (VOCs)

VOCs are chemicals that are emitted as gases from certain solids or liquids at room temperature. There are 50 – 300 chemicals that can be classed as VOCs in the average indoor environment. The main sources in domestic environments are paint, floor sealant, vinyl and furnishings.

VOCs are commonly found in paints, adhesives, cleaning supplies, composite wood products and furniture.

VOC levels have been shown to be a lot higher during and after construction. This is often apparent in the smell of a new building, or where a new carpet has been fitted. Off gassing of the VOCs from the materials may occur over a prolonged period of time. Formaldehyde is the most common VOC in indoor air, and is emitted from carpeting, particleboard, furniture and new clothing. It is colorless but has a distinctive odor. Certain VOCs, such as Formaldehyde, are often absorbed onto surfaces and textiles reducing peak concentrations but prolonging overall exposure. The most vulnerable are pre-toddler infants, who spend significant amounts of time in close proximity to the floor.

Exposure to VOCs is primarily though inhalation, although some VOCs are ingested through food, or liquids. Exposure to VOCs can result in irritation to the nose, throat and eyes; they can cause headaches, nausea, dizziness, and can aggravate asthma. Chronic health effects linked to VOC exposure include cancer, liver damage, kidney damage and central nervous system damage. The majority of studies have focused on occupational exposure, where VOC levels are often higher and on the impact of one specific chemical over a relatively short period. Little is known about the effect of combined exposure or of the effects of low level long term exposure. It has been repeatedly shown that working as a painter increases the risk of lung cancer by 40% - however, it has not been possible to identify the causative chemical due to mixed exposures.

Common VOCs are listed below:

- Formaldehyde • Benzene • Toluene
- Methylene • Chloride • Xylene
- Ethylene glycol • Texanol
- ß1, 3-butadiene

Many of the water based paints used in the home still contribute small amounts of VOCs to the indoor environment and have been linked to the exacerbation of asthma systems. Due to these medical concerns a number of '**VOC free**' paints have appeared on the market.

Halogenated Flame Retardants (HFRs)

HFRs are added to too many building materials – even when they are not needed. Fire scientists, toxicologists, and even firefighters are raising alarm bells around the world. There is no significant fire safety benefit from HFRs in foam or wiring behind walls or under concrete slabs, yet current US codes requires HFRs in these applications. Sadly, during a fire, HFRs release significantly more smoke and very toxic gases that harm/kill occupants and firefighters. There is currently a concerted effort in the green building movement to remove HFRs from materials when there is no added fire safety benefit.

Solvents (chemicals commonly used in paints and adhesives)

Risks range from irritation & headaches to dermatitis, color blindness, brain damage, cancer and even death.

Can furniture be hazardous?

From halogenated flame retardants in foam cushions to hexavalent chromium in upholstery materials, everyday office furniture often comes with troubling human health concerns.

And furniture is only the tip of a very toxic iceberg of hazards you need to watch out for when specifying building products and materials — starting with your site and building envelop and all the way in to your interior finishes.

As the world is finding out, it is possible to identify healthier products and materials and still create gorgeous, energy-efficient, occupant-friendly buildings — without busting budgets or getting overwhelmed by complex health and chemical data.

So what are some alternative building materials for those we have listed above?

PVC piping for potable water can easily be swapped out with copper, PEX or polypropylene, and there are even less expensive alternatives for non-potable water piping.

PTFE is an economic substitute for PVC.

Lead in potable water plumbing should be avoided where possible. Most brass fittings and valves do contain trace amounts of lead, but eliminating lead from flux and solder is low hanging fruit.

Light Emitting Diodes (LEDs) are far more energy efficient than CFLs, and they do not contain mercury.

Halogenated Flame Retardants (HFRs) are in all foam products, and now the only avoidance strategy available is to not

specify foam. There are alternatives to PVC- and HFR-jacketed wiring, but the cost premium to avoid these toxins is so high it is out of the reach of most home builders.

Possible formaldehyde alternatives include cellulose insulation in lieu of foamed insulation; water-based paint in lieu of wallpaper and associated glues; timber in lieu of MDF and chipboard (Note: timber naturally contains formaldehyde, but at levels that are acceptable in terms of minimum health risk).

Possible solvent free alternatives include natural water-based emulsion paint; linseed oil-based gloss paint; avoidance of materials containing or requiring glues, e.g. manufactured wood products, wallpaper; where use of glues is unavoidable, (e.g. for installation of linoleum or rubber flooring) use solvent & formaldehyde free glues; avoidance of timber treatments through detailing.

"Of the 75,000 synthetic chemicals which are now in common commercial use, less than 3% have been tested for carcinogenicity. In 1994, 2.26 billion pounds of toxic chemical were released into the environment, of which, 177 million pounds were known or suspected carcinogens. Most testing of chemical toxicity is undertaken on the basis of exposure at work by adults. We are ignorant of the effects on children and other species which might be vital to the ecological make-up of the planet. No one knows the cocktail effect. It is permitted only because the victims are anonymous." Steingraber in Living Downstream

While we cannot expect the building industry to change overnight, there are alternatives already on the market that illustrate the potential for greater sustainability and healthier products. Manufacturers can reduce or remove problem chemicals quickly without compromising the performance and aesthetics of the building material. Perhaps innovative efforts can bring to market more sustainable products with even greater performance and aesthetic characteristics than the industry is accustomed to. With greater awareness of the health issues in relation to building materials, end users and designers can make more informed decisions and collectively help move the market by their specifications and purchasing power.

Given the trend towards improving health & well-being, enhancing biodiversity and waste minimization there will be increasing attention to the toxicity of materials in the future. The burden of responsibility increasingly lies with designers to use materials that can be safely reused and can withstand future, more stringent, regulation. The use of outputs from other industries as inputs to the construction industry demands that we use extreme caution to ensure that these materials do not introduce a toxic burden to buildings.

The marketplace for alternatives to hazardous chemicals in building products increases daily. More and larger market players are publicly committed to sourcing products made without the use of chlorinated plastics, VOCs, SVOCs, and/ or heavy metals. Health care institutions are uniquely positioned to play a leadership role in moving away from toxic building products by sourcing healthier materials and signaling the marketplace that the use of dangerous chemicals will no longer be tolerated.

Sources -

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