

Living Building Challenge: Red List Materials and Chemicals Summary Statements

Cadmium

The US Department of Health and Human Services and the International Agency for Research on Cancer have determined that cadmium is a known human carcinogen, associated with lung cancer. Additionally, acute and long-term exposures can lead to lung and kidney damage, bone loss, hypertension. In sufficient quantities, cadmium is lethal. Cadmium's extreme toxicity means that overexposure can occur even when only trace amounts are present, such as during smelting and electroplating activities.

REF: <http://www.inchem.org/documents/iarc/vol58/mono58-2.html>

Chlorinated Polyethylene and Chlorosulfonated Polyethylene

Chlorinated Polyethylene (CPE) and Chlorosulfonated Polyethylene (CSPE) are Persistent Organic Pollutant Source Materials: due to their carbon-chlorine bases, these products contribute to the creation of dioxins and furans at different points in their life cycle (often manufacturing and/or disposal). According to the World Health Organization, dioxins are some of the most potent toxins known to humans, with no known safe limit for exposure and a strong propensity for bioaccumulation. In addition, dioxins are highly persistent in the environment. Similarly, furans accumulate in animal fat, concentrating as they travel up the food chain. Non-chlorinated polyethylene products are readily available in many product categories.

REF (dioxins): <http://www.who.int/mediacentre/factsheets/fs225/en/index.html>

Chlorofluorocarbons (CFCs)

According to USEPA, the depletion of the Earth's protective ozone layer by chlorofluorocarbons (or CFCs) is responsible for an increased incidence of skin cancer, cataracts, impairment of human immune systems, and damage to wildlife. CFCs have been banned from production in the United States since 1995.

REF (CFC effects on ozone): http://www.epa.gov/ozone/science/sc_fact.html

REF (ozone depletion and human health): <http://www.who.int/globalchange/climate/summary/en/index7.html>

Chloroprene (Neoprene)

Chloroprene is a Persistent Organic Pollutant Source Material. Due to its carbon-chlorine base, it contributes to the creation of dioxins at different points in its life cycle (often manufacturing and/or disposal). According to the World Health Organization, dioxins are some of the most potent toxins known to humans, with no known safe limit for exposure and a strong propensity for bioaccumulation. In addition, dioxins are highly persistent in the environment.

REF (dioxins): REF: (dioxins): <http://www.who.int/mediacentre/factsheets/fs225/en/index.html>

Formaldehyde (added)

Formaldehyde is classified by the International Agency for Research on Cancer and the State of California as a known human carcinogen. Common health effects at low levels of exposure to this volatile organic compound include irritation and sensitization as well as acting as an asthma trigger, and long-term exposure is associated with nasal cancers and leukemia.

REF: <http://www.cancer.gov/cancertopics/factsheet/risk/formaldehyde>

Halogenated Flame Retardants

Halogenated Fire Retardants (HFRs) are a broad class of flame retardants containing chlorine or bromine that have aroused concern due to their exponential accumulation in human beings in recent years. HFRs are persistent bioaccumulative toxins, meaning that they accumulate in organisms and the broader environment, often reaching alarmingly high concentrations as they travel up the food chain. In addition, certain halogenated products have shown evidence of harm to humans and other animal species. According to the Washington State Department of Ecology, for example, the toxicity endpoints of concern for Penta-PBDE include adverse effects on neurological development, reproduction, thyroid hormone disruption and possible liver toxicity.

REF: <http://www.ecy.wa.gov/biblio/0507048.html>

Hydrochlorofluorocarbons (HCFCs)

Hydrochlorofluorocarbons (HCFCs) are potent ozone depleting compounds. While less destructive than the now-banned chlorofluorocarbons, HCFCs are targeted for gradual phase-out by the US EPA with a total ban going into effect in the year 2030. According to USEPA, the depletion of the Earth's protective ozone layer is responsible for an increased incidence of skin cancer, cataracts, impairment of human immune systems, and damage to wildlife.

REF: <http://www.environment-agency.gov.uk/business/topics/pollution/684.aspx>

Lead

According to the Agency for Toxic Substances and Disease Registry, the environmental levels of lead have increased over 1000 fold over the last three centuries, due almost exclusively to human activities. Lead exposure is damaging to virtually every organ and system in the human body, but is particularly damaging to the brain and central nervous system—profoundly so for young children and developing fetuses. Lead exposure is correlated with decreased IQ and delayed learning in children; scientific research has identified no safe level of lead exposure, and effects are irreversible.

REF: <http://www.atsdr.cdc.gov/tfacts13.html>

Mercury

According to the World Health Organization, mercury produces a suite of ill effects, including harm to the nervous, digestive and immune systems, and even death. WHO lists children and developing fetuses as especially vulnerable to damage from mercury. Mercury biointensifies in the environment, accumulating in predator species such as tuna and human beings, eventually reaching concentrations thousands of times more intense than ambient levels.

REF: <http://www.epa.gov/hg/effects.htm>

Petrochemical Fertilizers and Pesticides

According to the US EPA, the human health effects of pesticide exposure vary with the pesticide, from acute irritation and destruction of skin tissue, to damage to the nervous system, cancer, and death. Petrochemical fertilizers and pesticides represent a vast family of products with an equally vast range of negative human health, animal and ecosystem effects, from the nitrogen loading of our water bodies resulting in hypoxic aquatic conditions, to the specific toxicological effects of various pesticides, which range depending on the class of chemicals, from arsenical pesticides (liver, kidney, brain, bone marrow and nervous system toxicity) to halocarbons (heart muscle, lung, brain, liver and kidney damage).

REF: <http://www.epa.gov/pesticides/health/human.htm>

Phthalates

Mounting evidence from animal studies show the hormone disrupting potential of phthalates, prompting the National Research Council to urge the US Environmental Protection Agency to pursue a “cumulative risk assessment” of this class of chemicals to determine their interactivity. Testing by the Centers for Disease Control and Prevention shows that phthalates are nearly ubiquitous in the US population, with highest concentrations in women and in children aged 6 to 11 years. The endocrine disrupting nature of phthalates has implications for childhood and reproductive development, as well as cancer incidence. The European Union and over a dozen countries have banned the use of phthalates in children’s products, as has the State of California.

REF (ATSDR info specifically on DEHP, one of the more common phthalates): <http://www.atsdr.cdc.gov/tfacts9.html>

REF (phthalates—Environmental Working Group perspective): <http://www.ewg.org/node/25808>

REF (cumulative risk assessment): <http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=12528>

Polyvinyl Chloride (PVC)

PVC’s vinyl chloride monomer building block is a known human carcinogen, according to the US Department of Health and Human Services. In addition, PVC is a Persistent Organic Pollutant Source Material. Due to its chlorine content, PVC manufacture often contains other substances of concern, such as cadmium, lead, and phthalates, and can result in the production of dioxins during production and disposal phases. Dioxins, specifically TCDD, accumulate in human and animal tissue and are associated with immune system impairment, damage to developing nervous systems, and damage to the endocrine and reproductive systems. TCDD is listed as a “known human carcinogen” by the International Agency for Research on Cancer.

REF: (dioxins): <http://www.who.int/mediacentre/factsheets/fs225/en/index.html>

REF: (vinyl chloride): <http://www.atsdr.cdc.gov/tfacts20.html>

Wood treatments containing Creosote, Arsenic or Pentachlorophenol

Many conventional wood treatments introduce a litany of human health and environmental problems. The traits that make wood treatments effective at retarding rot and insect damage are also effective at damaging many other forms of life.

- According to the US Department of Health and Human Services, creosote exposure is associated with skin and scrotum cancer in humans, and liver, kidney, and gestational problems in laboratory animals.
- According to the US Department of Health and Human Services, inorganic arsenic is not only an acute toxin; it is a known human carcinogen.
- According to the US Department of Health and Human Services, pentachlorophenol is linked to liver and immune system damage in humans, and reproductive and thyroid damage in laboratory animals.

REF: (creosote): <http://www.atsdr.cdc.gov/tfacts85.html>

REF: (arsenic): <http://www.atsdr.cdc.gov/tfacts2.html>

REF (pentachlorophenol): <http://www.atsdr.cdc.gov/tfacts51.html>