Details for Halogenated Flame Retardants (HFR) & Brominated Flame Retardants

Category: Flame Retardants

Origin and Source: A class of retardants that includes polybrominated diphenyl ether (PBDE), hexabromocyclododecane (HBCD), tetrabromobisphenol A (TBBPA),

Health Impact Summary: Suspected carcinogen, hormone disruptor, neurobehavioral toxin

Building Products Where Commonly Found: Fabrics, plastics, foams, insulation, carpet backing, epoxy and resins, kitchen appliance, housing paints, and electrical devices

Alternative Materials: For fire extinguishing agents in lieu of Halon, which is virtually banned anyway, suggest either Argon (volume intensive as it is delivered at normal pressures).

Divisions and Sections: Div 09 Fabric-Wrapped Panels
Div 09 Stretched-Fabric Wall Systems
Div 12 Custom Upholstered Seating
Div 12 Guest Room Furniture
Div 12 Healthcare Seating
Div 12 Office Furniture
Div 12 Patient Room Furniture
Div 12 Restaurant Furniture

Known Health Effects / Classification References:

Suspected Health Effects / Classification References:

Regulatory: Some types are banned in the EU, and currently in US some states have passed laws banning PBDEs.

Green Building Rating System Credits: Living Building Challenge (1.2)-Prerequisite 5 for halogenated flame retardants.

Details for Bisphenol A (BPA) (80-05-7)

Category: Chemical Compounds

Origin and Source: Also known as 4,4'-Isopropylidenediphenol. BPA in a synthesized chemical compound first made for the Medical Industry in 1891 as an estrogen emulator.

Health Impact Summary: Known endocrine disruptor (WWF), that blocks hormones particularly estrogen. Linked to reduced sperm production, increased prostate weight and affecting the onset of puberty.

Building Products Where Commonly Found: Adhesives, protective coatings, paint, piping, epoxy resins, wire/electronic sheathing, and polycarbonate plastic products

Alternative Materials: PET plastic for wire jacketing. PET and polyester plastics for sheet plastics; for other applications such as adhesives, protective coatings, paint, piping, epoxy resins there are many alternative materials

Divisions and Sections: Div 07 Composite Wall Panels
Div 07 Fluid-Applied Membrane Air Barriers
Div 07 Joint Sealants
Div 08 Plastic Glazing
Div 08 Structured-Polycarbonate-Panel Assemblies
Div 09 Fluid-Applied Athletic Flooring
Div 09 High-Performance Coatings
Div 09 High-Temperature-Resistant Coatings
Div 09 Resinous Flooring
Div 09 Resinous Matrix Terrazzo Flooring
Div 10 Signage
Div 10 Toilet Compartments
Div 10 Wall and Door Protection
Div 32 Unit Paving

Known Health Effects / Classification References:

Suspected Health Effects / Classification References: Cardiovascular or Blood Toxicant (RTECS)
Endocrine Toxicant (BKH) (GUIL) (IL-EPA) (JNIHS) (KEIT) (RTECS) (WWF)
Gastrointestinal or Liver Toxicant (RTECS)
Immunotoxicant (HAZMAP)
Kidney Toxicant (RTECS)
Neurotoxicant (RTECS)
Reproductive Toxicant (JANK) (NTP-R)
Skin or Sense Organ Toxicant (HAZMAP) (KLAA)

Regulatory: Unsuccessful call for a ban in Europe in 2000 by WWF; on the EPA's list of "Toxic Release Inventory Chemicals"

Details for Phthalates (EDF-150)

Category: Chemical Compounds

Origin and Source: A plasticizer used mostly in the production of flexible PVC products

Health Impact Summary: Building Products Where Commonly Found: Pipes, conduits, waterproofing, roofing, siding, door and windows, resilient flooring, carpet backing, wall covering, signage, window treatments, furniture, and wire cable sheathing

Alternative Materials: PET plastic for wiring jacketing; natural and polyolefin materials for wallcovers; Rubber, Linoleum, PVC-free resilient flooring options; Nylon, Polyester for shower curtains; Polyurethane, Nylon, Nylon Microfiber and Polyethylene; Fiberglass base with cotton flocked backing, polyester with acrylic foamed backing, polyester, polyester and cotton, Olefin-coated olefin yarn, and Thermoplastic Olefin. There are many PVC-free options for piping, conduits, flooring, carpet, wall protection systems, windows & doors, backings, and window treatments.

Divisions and Sections: Div 03 Water Stops
Div 04 PVC Flashing (Elastomeric Thermoplastic Flashing)
Div 04 Unit Masonry
Div 07 Dampproofing and Waterproofing
Div 07 Membrane Roofing
Div 07 Polyvinyl-Chloride (PVC) Roofing
Div 07 Self-Adhering Sheet Waterproofing
Div 07 Siding
Div 08 Gasketing
Div 08 Vinyl Window
Div 09 Fabric-Wrapped Panels
Div 09 Resilient Athletic Flooring
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Static-Control Resilient Flooring
Div 09 Stretched-Fabric Wall Systems
Div 09 Tile Carpeting
Div 09 Wall Coverings
Div 10 Accordion Folding Partitions
Div 10 Awnings
Div 10 Banners
Div 10 Cubicles
Div 10 Operable Partitions
Div 10 Operable Partitions
Div 10 Signage
Div 10 Toilet Compartments
Div 10 Visual Display Surfaces
Div 10 Wall and Door Protection
Div 10 Wall Protection
Div 11 Gymnasium Equipment
Div 11 Loading Dock Equipment
Div 11 Play Field Equipment and Structures
Div 11 Projection Screens
Div 12 Entrance Floor Mats and Frames
Div 12 Horizontal Louver Blinds
Div 12 Site Furnishings
Div 12 Vertical Louver Blinds
Div 32 Chain Link Fences and Gates
Div 32 Playground Protective Surfacing
Div 33 Utilities
Known Health Effects / Classification References: Carcinogen (P65)
Developmental Toxicant (P65)
Reproductive Toxicant (P65)

Suspected Health Effects / Classification References: Endocrine Toxicant (BKH) (IL-EPA) (JNIHS) (KEIT) (WWF)
Gastrointestinal or Liver Toxicant (EPA-HEN) (OEHHA-CREL) (RTECS)
Respiratory Toxicant (OEHHA-CREL) (RTECS)
Skin or Sense Organ Toxicant (RTECS)

Green Building Rating System Credits: Living Building Challenge (1.2) - Prerequisite 5/ Green Guide for Health Care - MR Credit 4.5
Details for Chlorinated Polyethylene (CPE) (63231-66-3)

Category: Chlorinated Polymers

Origin and Source: One of the 11,000± chlorinated organic compounds that have been widely used since World War II.

Health Impact Summary: Like all other chlorinated materials, is associated with the known carcinogen dioxin, and other POP (persistent organic pollutants), and PBT (persistent bio- accumulative toxins).

Building Products Where Commonly Found: Geomembranes, wire and cable jacketing.

Alternative Materials: Geomembranes, wire and cable jacketing.

Divisions and Sections:
- Div 07 Drainage Panel
- Div 32 Playground Protective Surfacing
- Div 33 Utilities

Known Health Effects / Classification References:
- Carcinogen (IARC) (NTP-C) (P65)
- Developmental Toxicant (P65)

Suspected Health Effects / Classification References:
- Cardiovascular or Blood Toxicant (ATSDR) (EPA-HEN) (LADO - L) (OEHLA-CREL) (RTECS)
- Endocrine Toxicant (BKH) (BRUC) (IL-EPA) (JNIHS) (KEIT) (OEHLA-CREL) (RTECS) (WWF)
- Gastrointestinal or Liver Toxicant (EPA-HEN) (LADO - L) (OEHLA-CREL) (RTECS) (ZIMM)
- Immunotoxicant (ATSDR)
- Kidney Toxicant (RTECS)
- Neurotoxicant (STAC)
- Reproductive Toxicant (OEHLA-CREL)
- Respiratory Toxicant (OEHLA-CREL) (RTECS)
- Skin or Sense Organ Toxicant (EPA-HEN) (HAZMAP) (KLAA) (RTECS)

Green Building Rating System Credits:
- Green Guide for Health care - MR Credit 4.1

General Reference: http://www.healthybuilding.net/target_materials.html
Details for Polyvinyl Chloride (PVC) (9002-86-2)

Category: Chlorinated Polymers

Origin and Source: Polyvinyl Chloride was first discovered in the 19th century, but in 1926, Waldo Semon developed a method to plasticize PVC that resulted in a more flexible and easily processed material. Phthalates is a plasticizer used mostly in the production of flexible PVC products. Today PVC is by far the most common chlorine based material in the world.

Health Impact Summary: The potent carcinogen dioxin is created in production of PVC and it can cause severe health problems such as cancer, endocrine disruption, endometriosis, neurological damage, birth defects, impaired child development, reproductive and immune system damage.

Building Products Where Commonly Found: Pipes, conduits, waterproofing, roofing, siding, door and windows, resilient flooring, carpet backing, wall covering, signage, window treatments, furniture, and wire cable sheathing.

Alternative Materials: PET plastic for wiring jacketing; natural and polyolefin materials for wallcovers; Rubber, Linoleum, PVC-free resilient flooring options, Nylon, Polyester for shower curtains; Polyurethane, Nylon, Nylon Microfiber and Polyethylene; Fiberglass base with cotton flocked backing, polyester with acrylic foamed backing, polyester, polyester and cotton, Olefin-coated olefin yarn, and Thermoplastic Olefin. There are many PVC-free options for piping, conduits, flooring, carpet, wall protection systems, windows & doors, backings, and window treatments.

Divisions and Sections:
- Div 03 Water Stops
- Div 04 PVC Flashing (Elastomeric Thermoplastic Flashing)
- Div 04 Unit Masonry
- Div 07 Dampproofing and Waterproofing
- Div 07 Membrane Roofing
- Div 07 Polyvinyl-Chloride (PVC) Roofing
- Div 07 Self-Adhering Sheet Waterproofing
- Div 07 Siding
- Div 08 Gasketing
- Div 08 Vinyl Window
- Div 09 Fabric-Wrapped Panels
- Div 09 Resilient Athletic Flooring
- Div 09 Resilient Base and Accessories
- Div 09 Resilient Sheet Flooring
- Div 09 Resilient Tile Flooring
- Div 09 Static-Control Resilient Flooring
- Div 09 Stretched-Fabric Wall Systems
- Div 09 Tile Carpeting
- Div 09 Wall Coverings
- Div 10 Accordion Folding Partitions
- Div 10 Awnings
- Div 10 Banners
- Div 10 Cubicles
- Div 10 Flagpoles
- Div 10 Operable Partitions
- Div 10 Signage
- Div 10 Toilet Compartments
- Div 10 Toilet, Bath, and Laundry Accessories
- Div 10 Visual Display Surfaces
- Div 10 Walkway Covers
- Div 11 Gymnasium Equipment
- Div 11 Loading Dock Equipment
- Div 11 Play Field Equipment and Structures
- Div 11 Projection Screens
Div 12 Entrance Floor Mats and Frames
Div 12 Horizontal Louver Blinds
Div 12 Site Furnishings
Div 12 Vertical Louver Blinds
Div 32 Chain Link Fences and Gates
Div 32 Playground Protective Surfacing
Div 33 Utilities

Known Health Effects / Classification References:
- Carcinogen (IARC) (NTP-C) (P65)
- Developmental Toxicant (P65)

Suspected Health Effects / Classification References:
- Cardiovascular or Blood Toxicant (ATSDR) (EPA-HEN) (LADO - L)
- Endocrine Toxicant (BKH) (BRUC) (IL-EPA) (JNIHS) (KEIT) (OEHHA-CREL) (RTECS)
- Gastrointestinal or Liver Toxicant (DIPA) (EPA-HEN) (LADO - L) (OEHHA-CREL) (RTECS)
- Immunotoxicant (ATSDR)
- Kidney Toxicant (RTECS)
- Neurotoxicant (STAC)
- Reproductive Toxicant (OEHHA-CREL)
- Respiratory Toxicant (HAZMAP) (OEHHA-CREL) (RTECS)
- Skin or Sense Organ Toxicant (EPA-HEN) (HAZMAP) (KLAA) (RTECS)

Regulatory:
- Several bans are currently under consideration in the EU. In NYC - PVC piping is not permitted in any buildings other than one and two family homes.

Green Building Rating System Credits:
- Living Building Challenge (1.2) - Prerequisite 5/ Green Guide for Health Care - MR Credit 4.1

Details for Polystyrene (9003-53-6)

Category: Fossil Fuel Based

Origin and Source: Polystyrene is a polymer made of petroleum.

Health Impact Summary: Identified by EPA as a possible carcinogen, mutagen, chronic toxin, and environmental toxin. Further, it is produced from benzene, another chemical with both environmental and health concerns.

Building Products Where Commonly Found: Rigid Insulation

Alternative Materials: Use semi-rigid mineral board for exterior wall cavity insulation in exterior metal panels and masonry walls

Divisions and Sections:
- Div 07 Composite Wall Panels
- Div 07 Insulated-Core Metal Wall Panels
- Div 07 Metal Wall Panels
- Div 07 Thermal Insulation
- Div 09 Tiling
- Div 10 Accordion Folding Partitions
- Div 10 Demountable Partitions
- Div 10 Operable Partitions

Known Health Effects / Classification References:

Suspected Health Effects / Classification References:
- Immunotoxicant (HAZMAP)
- Respiratory Toxicant (HAZMAP)
- Skin or Sense Organ Toxicant (HAZMAP)
Details for Polyurethane Foam

Category: Fossil Fuel Based

Origin and Source: The term polyurethane (PUR) is used to cover materials formed from the reaction of isocyanates and polyols. Polyurethane foam's differs from other cellular plastics and that the chemical reaction causing foam occurs simultaneously with the Polymer-forming reactions.

Health Impact Summary: CFCs and HCFCs are common blowing agents for this material - see ozone depleting materials.

Building Products Where Commonly Found: Rigid Insulation, carpet backing, firestopping foams, and foams.

Alternative Materials: Foam for upholstery applications - soy based foams or PBDE-free foams. There are non-ozone depleting alternatives for blow-in insulation, liquid sealant or putty firestopping materials, silicone adhesives, non-foam paints and sealers.

Divisions and Sections: Div 07 Expansion Control
Div 07 Fluid-Applied Membrane Air Barriers
Div 07 Joint Sealants
Div 12 Custom Upholstered Seating
Div 12 Guest Room Furniture
Div 12 Healthcare Seating
Div 12 Office Furniture
Div 12 Patient Room Furniture
Div 12 Restaurant Furniture

Known Health Effects / Classification References:

Suspected Health Effects / Classification References: Cardiovascular or Blood Toxicant (LADO - L)
Neurotoxicant (HAZMAP)

Green Building Rating System Credits: Living Building Challenge (1.2)-Prerequisite 5
Details for Urea-Formaldehyde (HCHO) (50-00-0)

Category: Indoor Air Quality

Origin and Source: Also known as Urea-methanol. Approximately 6 billion pounds of formaldehyde is produced in this country annually.

Health Impact Summary: EPA classification: B1 (probable human carcinogen - based on limited evidence of carcinogenicity in humans) and suspected asthma trigger; other health side effects include irritation of mucous membranes and skin reactions.

Building Products Where Commonly Found: Composite wood products, insulation, furniture, and adhesives.

Alternative Materials: There are many readily available composite wood, insulation, furniture, and adhesives products that don't have any added urea-formaldehyde.

Divisions and Sections:
- Div 06 Exterior Architectural Woodwork
- Div 06 Exterior Finish Carpentry
- Div 06 Glued-Laminated Construction
- Div 06 Heavy Timber Construction
- Div 06 Interior Architectural Woodwork
- Div 06 Interior Finish Carpentry
- Div 06 Miscellaneous Rough Carpentry
- Div 06 Rough Carpentry
- Div 06 Sheathing
- Div 06 Shop-Fabricated Wood Trusses
- Div 06 Wood Paneling
- Div 07 Fiberglass-Sandwich-Panel Assemblies
- Div 07 Intumescent Fireproofing
- Div 07 Self-Adhering Sheet Waterproofing
- Div 07 Thermal Insulation
- Div 07 Water Repellents
- Div 09 Cementitious Coatings
- Div 09 Elastomeric Coatings
- Div 09 Exterior Painting
- Div 09 Fabric-Wrapped Panels
- Div 09 Fixed Sound-Absorptive Panels
- Div 09 High-Performance Coatings
- Div 09 High-Temperature-Resistant Coatings
- Div 09 Interior Painting
- Div 09 Multicolor Interior Finishing
- Div 09 Staining and Transparent Finishing

Known Health Effects / Classification References: Carcinogen (P65)


Regulatory: Was almost banned in the 1980s but overturned in the courts.

Green Building Rating System Credits: Living Building Challenge (1.2)-Prerequisite 5/ LEED-NC:IAQ Credit 4.4/ Green Guide for Healthcare-IAQ Credit 4.4

Details for Volatile Organic Compounds (VOCs)

Category: Indoor Air Quality

Origin and Source: VOCs are organic chemical compounds that emit gases in solid and liquid states.

Health Impact Summary: Suspected Carcinogen, Development and Reproductive Toxicant (CA-P65) and suspected asthma trigger.

Building Products Where Commonly Found: Paint, sealants, roofing products, resilient flooring, carpets, adhesives, and sealants

Alternative Materials: There are many readily available roofing products, resilient flooring products, carpets, adhesives, and sealants that have low or zero VOC emissions.

Divisions and Sections:
- Div 06 Exterior Architectural Woodwork
- Div 06 Exterior Finish Carpentry
- Div 06 Glued-Laminated Construction
- Div 06 Heavy Timber Construction
- Div 06 Interior Architectural Woodwork
- Div 06 Interior Finish Carpentry
- Div 06 Miscellaneous Rough Carpentry
- Div 06 Rough Carpentry
- Div 06 Sheathing
- Div 06 Shop-Fabricated Wood Trusses
- Div 06 Wood Paneling
- Div 07 Fiberglass-Sandwich-Panel Assemblies
- Div 07 Intumescent Fireproofing
- Div 07 Self-Adhering Sheet Waterproofing
- Div 07 Thermal Insulation
- Div 07 Water Repellents
- Div 09 Cementitious Coatings
- Div 09 Elastomeric Coatings
- Div 09 Exterior Painting
- Div 09 Fabric-Wrapped Panels
- Div 09 Fixed Sound-Absorptive Panels
- Div 09 High-Performance Coatings
- Div 09 High-Temperature-Resistant Coatings
- Div 09 Interior Painting
- Div 09 Multicolor Interior Finishing
- Div 09 Staining and Transparent Finishing

Known Health Effects / Classification References:

Suspected Health Effects / Classification References: Carcinogen (P65-MC)

Regulatory: California and several northeastern states are now regulating the VOC levels of many consumer products.

Green Building Rating System Credits:
- LEED - NC: Credits IAQ 4.1, 4.2, 4.3, 4.4/ Green Guide for Health care - IAQ Credits 4.1 thru 4.5

General Reference: [http://www.epa.gov/iaq/voc.html](http://www.epa.gov/iaq/voc.html)
Details for Organostannic Compounds also known as Tin Compound (7440-31-5)

Category: Metals and Metal Compounds

Origin and Source: Tin (or Organostannic Compounds) is a natural compound (symbol Sn). However when tin is combined with carbon it forms organotin compounds.

Health Impact Summary: Health issues associated with neurological problems, skin and eye irritation (Agency for Toxic Substances and Disease Registry)

Building Products Where Commonly Found: Anti-fouling protective coatings and paints for equipment that is partially or fully submerged.

Alternative Materials:

Divisions and Sections: Div 07 Sheet Metal Flashing and Trim
Div 07 Sheet Metal Roofing

Known Health Effects / Classification References:

Suspected Health Effects / Classification References: Cardiovascular or Blood Toxicant (ATSDR)
Immunotoxicant (HAZMAP)
Reproductive Toxicant (FRAZIER)
Respiratory Toxicant (KLAA) (LU - C) (NEME)

Regulatory: Tin and organic tin compounds are found on at least 8 of the National Priority List sites identified by the EPA

Details for Cadmium (7440-43-9)

Category: Metals and Metal Compounds
Origin and Source: Cadmium is a heavy metal in the periodic table (symbol CD) that is a byproduct of the zinc production process.
Health Impact: Persistent Bioaccumulative Toxic Chemical (EPA); EPA classification: B1 (probable human carcinogen - based on limited evidence of carcinogenicity in humans).

Summary: Building Products Where Commonly Found: Batteries, metal alloys, hardware coatings, and paints.

Alternative Materials: For hardware coatings - stainless steel and galvanized finishes. For all other applications there are viable cadmium free options.

Divisions and Sections:
- Div 07 Intumescent Fireproofing
- Div 09 Exterior Painting
- Div 09 High-Performance Coatings
- Div 09 High-Temperature-Resistant Coatings
- Div 09 Interior Painting
- Div 09 Multicolor Interior Finishing
- Div 09 Staining and Transparent Finishing

Known Health Effects / Classification:
- Carcinogen (P65)
- Developmental Toxicant (P65)
- Reproductive Toxicant (P65)

Suspected Health Effects / Classification:
- Cardiovascular or Blood Toxicant (KLAA) (LADO - L) (RTECS)
- Endocrine Toxicant (IL - EPA) (KEIT) (WWF)
- Kidney Toxicant (ATSDR) (EPA-HEN) (HAZMAP) (KLAA) (OEHHA-CREL) (RTECS) (STAC)
- Respiratory Toxicant (EPA-HEN) (HAZMAP) (NEME) (OEHHA-CREL) (RTECS)

Regulatory: On multiple federal and state chemical watch lists.

Green Building Rating System Credits:
- Living Building Challenge (1.2) - Prerequisite 5/ Green Guide for Health care-MR Credit 4.3

Details for Copper (for Exterior Material) (7440-50-8)

Category: Metals and Metal Compounds

Origin and Source: Copper is a chemical element (symbol Cu) that is a ductile metal with excellent electrical conductivity.

Health Impact Summary: When copper is used as an exterior material it is a known toxic to aquatic life and a suspected toxicant in humans.

Building Products Where Commonly Found: Piping, flashing, asphalt roofing, electrical devices, and decorative finishes

Alternative Materials: Stainless steel, galvanized steel, and paint finishes for flashing.

Divisions and Sections:
- Div 04 Unit Masonry
- Div 05 Decorative Metal
- Div 05 Decorative Metal Railings
- Div 07 Asphalt Shingles
- Div 07 Built-Up Asphalt Roofing
- Div 07 Insulated-Core Metal Wall Panels
- Div 07 Metal Plate Wall Panels
- Div 07 Metal Roof Panels
- Div 07 Metal Shingles
- Div 07 Metal Wall Panels

Known Health Effects / Classification

References:
- Cardiovascular or Blood Toxicant (HAZMAP) (KLAA)
- Developmental Toxicant (EPA-SARA)
- Gastrointestinal or Liver Toxicant (ATSDR) (DOSS) (RTECS) (ZIMM)
- Reproductive Toxicant (EPA-SARA) (FRAZIER)
- Respiratory Toxicant (NEME) (OEHHA-AREL) (OEHHA-CREL)


Green Building Rating System Credits: Green Guide for Healthcare-MR Credit 6

Details for Hexavalent Chromium (VI) (7440-47-3)

Category: Metals and Metal Compounds

Origin and Source: Chromium is a chemical element in the periodic table (symbol Cr). Chromium metal is extremely resistant to corrosion and oxidation, which is why it is used in stainless steel and chrome plating. Chromium (VI), or Hexavalent Chromium, is a form of chromium that is commonly combined with other elements to form compounds. The Roman numeral number indicates the number of valence electrons, which determines the types of compounds or chemical reactions a substance can participate in. Chromium(VI) is rapidly transformed by organic matter into chromium(III). Therefore, significant quantities of chromium(VI) are not a natural occurrence but rather almost always the result of human actions.

Health Impact Summary: EPA classification: A (Human carcinogen); Recognized Carcinogen (CA65) and suspected respiratory toxicant (EPA); has been respiratory problems (OSHA) during manufacturing/processing.

Building Products Where Commonly Found: Chrome plating, chrome chemical production, chromium pigments for paints and textile, wood preservation, leather tanning, and anti-corrosion coatings.

Alternative Materials: Stainless steel and anodized aluminum for plating and corrosion protection.

Divisions and Sections:

Known Health Effects / Classification References: Carcinogen (P65-MC)

Suspected Health Effects / Classification References: Respiratory Toxicant (EPA-HEN) (KLAA) (LU - C) (OEHHA-CREL)

Regulatory: OSHA has special workplace requirements for working with Cr (VI).

Details for Lead (7439-92-1)

Category: Metals and Metal Compounds

Origin and Source: For over 7,000 years humans have used this soft, heavy, and malleable metal. Lead is a chemical element (symbol Pb).

Health Impact Summary: EPA classification: B2 (Probable human carcinogen - based on sufficient evidence of carcinogenicity in animals); Persistent Bioaccumulative Toxicant (EPA) & Developmental Toxicant (CA-P65) - particularly in developing brains of fetuses and children. Lead can accumulate in the body and cause serious health problems.

Building Products Where Commonly Found: Flashing and roofing, radiation shielding, solder, and electrical cable jacketing

Alternative Materials: PET plastics for wire jacketing and stainless steel, galvanized, and paint finishes for flashing and roofing materials.

Divisions and Sections: Div 07 Sheet Metal Flashing and Trim

Known Health Effects / Classification References:
- Carcinogen (P65)
- Developmental Toxicant (P65)
- Reproductive Toxicant (P65)

Suspected Health Effects / Classification References:
- Cardiovascular or Blood Toxicant (EPA-HEN) (HAZMAP) (KLAA) (LADO - L) (MALA) (STAC)
- Endocrine Toxicant (BRUC) (IL-EPA) (KEIT) (WWF)
- Gastrointestinal or Liver Toxicant (EPA-HEN) (RTECS) (STAC)
- Kidney Toxicant (EPA-HEN) (HAZMAP) (KLAA) (STAC)
- Neurotoxicant (EPA-HEN) (EPA-SARA) (HAZMAP) (KLAA) (LU - C) (RTECS) (STAC)
- Respiratory Toxicant (NEME)
- Skin or Sense Organ Toxicant (KLAA)

Regulatory: No longer permitted for piping, paint, and gasoline because of health issues.

Green Building Rating System Credits: Living Building Challenge (1.2) - Prerequisite 5 / Green Guide for Health care - MR Credit 4.3

Details for Mercury (7439-97-6)
Category: Metals and Metal Compounds
Origin and Source: Mercury is a heavy metal (symbol Hg) which occurs naturally in the environment but is now mainly released by human activities.
Health Impact Summary: Persistent Bioaccumulative Toxin (EPA) - Prenatal exposure can result in deficits in language, memory, and attention. Note this is not solely a neurotoxin for children.
Building Products Where Commonly Found: Batteries, HVAC Controls, electrical components, paint, flooring, medical equipment, switches & relays, and lamps.
Alternative Materials: There are many alternative materials and products that are mercury free for batteries, HVAC controls, electrical components, paint, flooring, medical equipment, switches & relays, and lamps.

Known Health Effects / Classification References:
- Developmental Toxicant (P65)

Suspected Health Effects / Classification References:
- Cardiovascular or Blood Toxicant (KLAA)
- Endocrine Toxicant (IL-EPA) (KEIT) (WWF)
- Gastrointestinal or Liver Toxicant (RTECS) (STAC)
- Immunotoxicant (HAZMAP)
- Kidney Toxicant (HAZMAP) (KLAA) (STAC)

Neurotoxicant (ATSDR) (EPA-HEN) (EPA-SARA) (HAZMAP) (KLAA) (OEHHA-CREL) (RTECS) (STAC)
- Reproductive Toxicant (EPA-SARA) (FRAZIER) (HAZMAP) (OEHHA-AREL)
- Respiratory Toxicant (NEME)
- Skin or Sense Organ Toxicant (HAZMAP) (KLAA) (RTECS)

Green Building Rating System Credits: Green Guide for Healthcare - MR Credit 4.2

Details for Bromochlorodifluoromethane (353-59-3)

Category: Ozone Depleting Gases

Origin and Source: Also known as Halon, First developed during World War II as a fire extinguisher in airplanes and tanks.

Health Impact Summary: Ozone-depleting chemicals that increases the risk of skin cancer, suspected neurotoxin, and weakens immune systems (National Institute for Occupational Safety and Health's Registry of Toxic Effects of Chemical Substances).

Building Products Where Commonly Found: Dry fire suppression systems and extinguishers.

Alternative Materials: There are many ways to avoid the use of Halon in fire suppression systems.

Divisions and Sections:

Known Health Effects / Classification References:

Suspected Health Effects / Classification References: Neurotoxicant (RTECS)


Green Building Rating System Credits: LEED - NC: Credits EA 4
Details for Chlorofluorocarbons (CFC) (EDF-079)

**Category:** Ozone Depleting Gases

**Origin and Source:** In 1928, engineer Thomas Midgley developed Chlorofluorocarbons (CFC) as a replacement for toxic refrigerants of the time.

**Health Impact Summary:** Ozone-depleting chemical that increases the risk of skin cancer and weakens immune systems.

**Building Products Where Commonly Found:** HVAC - Refrigerant

**Alternative Materials:** R-22, R-123, R-134a, R-245fa, R-407c, and R-410a refrigerants

**Known Health Effects / Classification References:**

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<thead>
<tr>
<th>Suspected Health Effects / Classification References</th>
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<tbody>
<tr>
<td>Cardiovascular or Blood Toxicant (LADO - L)</td>
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<tr>
<td>Neurotoxicant (HAZMAP)</td>
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**Regulatory:** Currently banned in the US, but still found in old equipment.

**Green Building Rating System Credits:** Living Building Challenge (1.2)-Prerequisite 5/ LEED-NC:Credits EA 4
Details for Hydrochlorofluorocarbons (HCFC)
Category: Ozone Depleting Gases

Origin and Source: Hydrochlorofluorocarbons is a fluorcarbon used primarily as a substitute for CFCs, this chlorine-based compound has been used for over four decades as a refrigerant. HCFCs are a group of man-made compounds containing hydrogen, chlorine, fluorine and carbon.

Health Impact Summary: Ozone-depleting chemical that increases the risk of skin cancer and weakens immune systems.

Building Products Where Commonly Found: HVAC - Refrigerant

Alternative Materials: R-22, R-123, R-134a, R-245fa, R-407c, and R-410a refrigerants

Divisions and Sections:

Known Health Effects / Classification References:

Suspected Health Effects / Classification References: Cardiovascular or Blood Toxicant (LADO - L)
Neurotoxicant (HAZMAP)

Regulatory: A 1992 amendment of the Montreal Protocol requires R-22 and all other HCFCs to be phased out by 2010 for new HVAC equipment.

Green Building Rating System Credits:
Living Building Challenge (1.2)-Prerequisite 5/ LEED-NC:Credits EA 4

Details for Perfluorocarbons (PFC)
Category: Ozone Depleting Gases
Origin and Source: Includes Perfluoroctane sulfonate (PFOS) and Perfluorooctanoic acid (PFOA). Perfluorocarbons (PFCs) they are refrigerant gas developed in the 1920’s. That were implicated in global warming; it is chemical related to Agent Orange and was discovered through the development of PFCs.
Health Impact Summary: Ozone-depleting chemical that increases the risk of skin cancer and several studies have shown it accumulates in human tissue at a very fast rate.
Alternative Materials:
Divisions and Sections:
Div 09 Fabric-Wrapped Panels
Div 09 Stretched-Fabric Wall Systems
Div 12 Custom Upholstered Seating
Div 12 Guest Room Furniture
Div 12 Healthcare Seating
Div 12 Office Furniture
Div 12 Patient Room Furniture
Div 12 Restaurant Furniture

Known Health Effects / Classification References: 
Suspected Health Effects / Classification References:
Regulatory: A greenhouse gas that is targeted to be reduced as a part of The Kyoto Protocol to the United Nations Framework Convention on Climate Change.
Details for Arsenic (7440-38-2)

Category: Wood Additives and Treatments

Origin and Source: Arsenic is a chemical element in the periodic table (symbol As) that is not found alone in nature, but its compounds are common in minerals.

Health Impact Summary: EPA classification: A (Human carcinogen); Recognized Carcinogen and Development Toxicant (CA-P65) linked to skin cancer and cancer in the lungs, bladder, liver, kidney and prostate. Human exposure is most common through food and groundwater.

Building Products Where Commonly Found:

Alternative Materials: "Water based borates, Ammoniacal Copper Quaternary (ACQ), Ammoniacal Copper Quaternary (ACQ).

Divisions and Sections:
- Div 06 Exterior Finish Carpentry
- Div 06 Glued-Laminated Construction
- Div 06 Heavy Timber Construction
- Div 06 Miscellaneous Rough Carpentry
- Div 06 Rough Carpentry
- Div 06 Sheathing
- Div 06 Shop-Fabricated Wood Trusses

Known Health Effects / Classification References:
- Carcinogen (P65)
- Developmental Toxicant (P65)

Suspected Health Effects / Classification References:
- Cardiovascular or Blood Toxicant (EPA-HEN) (HAZMAP) (KLAA) (LADO - L) (MALA)
- Endocrine Toxicant (KEIT) (WWF)
- Gastrointestinal or Liver Toxicant (ATSDR) (DIPA) (EPA-HEN) (KLAA) (LADO - L) (MALA) (RTECS) (STAC) (ZIMM)
- Immunotoxicant (HAZMAP)
- Kidney Toxicant (EPA-HEN) (STAC)
- Neurotoxicant (EPA-HEN) (EPA-SARA) (HAZMAP) (KLAA) (LU - P) (OEHHAA-CREL) (RTECS) (STAC)
- Reproductive Toxicant (FRAZIER) (OEHHAA-AREL)
- Respiratory Toxicant (EPA-HEN) (HAZMAP) (KLAA) (LU - P) (NEME)
- Skin or Sense Organ Toxicant (ATSDR) (EPA-HEN) (HAZMAP) (LADO - L) (RTECS)

Regulatory: Sale of arsenic-treated wood halted by EPA In January 2004 for residential uses.

Green Building Rating System Credits:
- Living Building Challenge (1.2) - Prequisite 5

Details for Creosote (8001-58-9)
Category: Wood Additives and Treatments
Origin and Source: Cresote is a wood preservative intended to slow decay and increase the life expectancy of wood products.
Health Impact Summary: EPA classification: B1 (Probable human carcinogen - based on limited evidence of carcinogenicity in humans)
Building Products Where Commonly Found: Coal tar-based creosote is the most commonly used wood preservative in the United States. It is also used for roofing.
Alternative Materials: See above for wood treatments. There are many cresote free roofing products.
Divisions and Sections: Div 06 Asphalt Shingles
Div 06 Built-Up Asphalt Roofing
Div 06 Built-Up Coal Tar Roofing
Known Health Effects / Classification: Carcinogen (P65)
Suspected Health Effects / Classification: Neurotoxicant (RTECS)
Skin or Sense Organ Toxicant (LADO - L)
Regulatory: On at least 46 federal government watch lists
Green Building Rating System Credits: Living Building Challenge (1.2) - Prerequisite 5
Details for Pentachlorophenol (87-86-5)
Category: Wood Additives and Treatments
Origin and Source: Chlorinated hydrocarbon biocide, used as a defoliant, general herbicide, and as an ingredient of paints and stains designed to protect wooden structure is against termites, woodboring bees, and other insects.
Building Products Where Commonly Found: Wood treatment
Alternative Materials:
Divisions and Sections:
- Div 06 Exterior Finish Carpentry
- Div 06 Glued-Laminated Construction
- Div 06 Heavy Timber Construction
- Div 06 Miscellaneous Rough Carpentry
- Div 06 Rough Carpentry
- Div 06 Sheathing
- Div 06 Shop-Fabricated Wood Trusses

Known Health Effects / Classification References:
- Carcinogen (P65)

Suspected Health Effects / Classification References:
- Cardiovascular or Blood Toxicant (EPA-HEN) (LADO - L) (RTECS)
- Developmental Toxicant (EPA-SARA) (OEHHA-CREL)
- Endocrine Toxicant (ATSDR) (BRUC) (IL-EPA) (JNIHS) (KEIT) (RTECS) (WWF)
- Gastrointestinal or Liver Toxicant (EPA-HEN) (OEHHA-CREL) (RTECS)
- Immunotoxicant (EPA-HEN)
- Kidney Toxicant (EPA-HEN) (OEHHA-CREL)
- Neurotoxicant (EPA-HEN) (RTECS)
- Reproductive Toxicant (ATSDR) (EPA-SARA)
- Respiratory Toxicant (RTECS)
- Skin or Sense Organ Toxicant (EPA-HEN) (HAZMAP) (RTECS)

Regulatory: In the late 1980s the purchase and use of pentachlorophenol was restricted in the United States, and the general public may no longer buy it

Green Building Rating System Credits: Living Building Challenge (1.2) - Prerequisite 5

REFERENCES


ATSDR-FAQ - Agency for Toxic Substances and Disease Registry. ToxFAQs.

http://www.atsdr.cdc.gov/toxfaq.html

BKH - European Commission Endocrine Disrupters Website.

Towards the establishment of a priority list of substances for further evaluation of their role in endocrine disruption - Final report-November 2.
http://ec.europa.eu/environment/endocrine/strategy/substances_en.htm#report3

http://ec.europa.eu/environment/endocrine/index_en.htm

BRUC - Brucker-Davis, F. Effects of Environmental Synthetic Chemicals on Thyroid Function. Thyroid. 8(9): 827-856. 1998.


http://www.epa.gov/ttn/naaqs/standards/nox/s_nox_index.html


http://www.epa.gov/ttn/naaqs/standards/co/s_co_index.html


http://www.epa.gov/ttn/naaqs/standards/pm/s_pm_index.html


http://www.epa.gov/ttn/naaqs/standards/so2/s_so2_index.html

CERHR - National Toxicology Program Center for the Evaluation of Risks to Human Reproduction. NTP-CERHR Briefs and Expert Panel Reports.

http://cerhr.niehs.nih.gov/

CPDB - Carcinogenic Potency Database (CPDB)

Environmental Defense reviewed this compilation of results on carcinogenicity in rats and mice covering 1298 chemicals and added any chemical with positive results in at least two species by a relevant route of exposure to its list of suspect carcinogens.

http://potency.berkeley.edu


Table 2: Selected Agents with Purported D


Table 2: Chemically induced liver injury: morphologic feature

EDF - See Environmental Defense's Custom Hazard Identification documentation.

http://www.epa.gov/ttnatw01/hlthef/hapindex.html

EPA-SARA - US EPA. Roadmaps to Sources of Information on Chemicals Listed in the Emergency Planning Community and Community Right-to-Know Act (Also Known as SARA Title 3)

Section 313 Toxic Release Inventory (for Microcomputers). (Report Number EPADFDK9204)

EXTOX - EXtension TOXicology NETwork. Pesticide Information Profiles (PIPs). Older data.

http://extoxnet.orst.edu/pips/ghindex.html