

HBN's Transformation Targets - Version 1

Transformation Targets move beyond restricted substances lists to address the most significant opportunities in transforming the built environment. By pinpointing a small number of chemical groups for any given product category, and outlining a framework to work toward fully disclosed and assessed alternatives, all stakeholders can focus on the best solutions for material health challenges: avoidance, substitution, or green chemistry.

OVERALL ACTIONS FOR SPECIFIERS AND PURCHASERS OF MATERIALS:

- Ask for and prefer products that are free of target chemicals and are fully disclosed and assessed.
- See the [white paper](#) for more details.

OVERALL ACTIONS FOR MANUFACTURERS:

- Remove the target chemical without substitution if function is not required.
- Remove the target chemical and replace with fully assessed, safer alternative.
- Work toward full disclosure and assessment of product contents.

CATEGORY	TARGET CHEMICAL	HAZARDS	ACTIONS FOR SPECIFIERS AND PURCHASERS OF MATERIALS
PAINTS 	<ul style="list-style-type: none"> • APEs¹ • Isocyanates in specialty paints² 	 	<ul style="list-style-type: none"> Specify paints known to be free of alkylphenol ethoxylates (APEs). Design out products with isocyanates (e.g. use an actual whiteboard instead of whiteboard paint). Use the Paint Hazard Spectrum to choose the healthiest materials for your application.
	INSULATION <ul style="list-style-type: none"> • HFRs³ • Formaldehyde-based binders⁴ • Isocyanates² • HFC/HFO blowing agents⁵ 	 	<ul style="list-style-type: none"> Specify residential fiber glass batt insulation or formaldehyde-free mineral wool batts. Consider alternatives to rigid board insulation when possible. If board insulation is required, specify mineral wool boards and look for those that meet the requirements of California Department of Public Health (CDPH) Standard Method for Testing and Evaluation of VOC Emissions. If plastic foam insulation is used, look for those that are halogen-free. Avoid spray polyurethane foam (SPF) whenever possible. Use the Insulation Hazard Spectrum to choose the healthiest materials for your application.
FLOORING <ul style="list-style-type: none"> • PFAS⁶ • BPA related compounds⁷ • PVC and related polymers⁸ 	 	<ul style="list-style-type: none"> Look for carpet and other products that don't use fluorinated (PFAS-based) stain-repellent treatments. Avoid epoxy products, particularly those reacted on-site, such as fluid-applied flooring and flooring adhesives. Prefer non-vinyl flooring products and carpet without vinyl backing. Use the Flooring Hazard Spectrum to choose the healthiest materials for your application. 	

CATEGORY

TARGET CHEMICAL

HAZARDS

ACTIONS FOR SPECIFIERS AND PURCHASERS OF MATERIALS

DOORS, CABINETRY, AND MILLWORK



- Urea formaldehyde-based binders⁴
- Isocyanates²



Prefer solid wood products over composite. When using composite wood, specify materials that are NAF (no added formaldehyde) or ULEF (ultra-low-emitting formaldehyde) whenever possible.

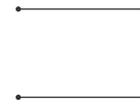
Request independent product testing to determine potential exposures to isocyanates during use for NAF products.

Use the [Doors](#) and [Cabinetry & Millwork Hazard Spectrum](#) to choose the healthiest materials for your application.

COUNTERTOPS



- PFAS⁵
- Formaldehyde-based binders⁴



Specify countertops that do not need to be sealed after installation, such as engineered stone, cultured marble, or solid surfacing.

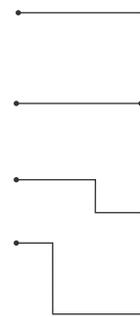
Plastic laminate is not a top countertop choice, but if used, specify that the substrate be made with NAF or ULEF resins.

Use the [Countertops Hazard Spectrum](#) to choose the healthiest countertop for your application.

SEALANTS



- Orthophthalates⁹
- Isocyanates²
- Cyclosiloxanes¹⁰
- PAHs in coal tar driveway and parking lot sealants⁹



Avoid orthophthalate plasticizers, which are common in polyurethane and modified polymer sealants. While not common, these may also be found in some acrylic latex or siliconized acrylic sealants.

If foam sealing products are needed, prefer those that are not reacted on site.

Avoid silicone sealants when possible.

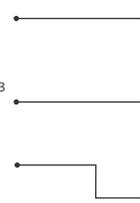
Use the [Sealant Hazard Spectrum](#) to choose the healthiest material for your application.

Avoid using pavement sealed with coal tar sealants in residential areas where it can be tracked indoors.

VARIOUS PRODUCT CATEGORIES



- Organotin compounds¹²
- Arsenic and arsenic compounds¹³
- Heavy metals in recycled content¹⁴



Prefer products that fully disclose catalysts and stabilizers.

Avoid arsenic compounds, specifically, arsenic-based biocides, commonly found in some types of silicone sealants, and chromated copper arsenate (CCA)-treated wood.

Request that manufacturers know the origin of post-consumer recycled content, avoid known sources of heavy metals (e.g., wire and cable scrap and cathode ray tubes), and test incoming recycled feedstocks.

Endnotes

These endnotes provide examples and sources for hazard information and products in which target chemicals are commonly found within the target category. This is not an exhaustive list but is meant to provide more information on how the targets were chosen. Target chemicals may have additional hazards not listed here and may be found in other types of products within the target categories and outside of the target categories.

1. **Alkylphenol ethoxylates** (APEs) include nonylphenol ethoxylates and octylphenol ethoxylates. **Nonylphenol ethoxylates** are on the EU Candidate List of Substances of Very High Concern due to **endocrine disrupting properties**. Nonylphenol ethoxylates and **octylphenol ethoxylates** are on the ChemSec SIN List for **endocrine disruption** and on The Endocrine Disruption Exchange for potential **endocrine disruption**. APEs can be found in **wall** and **ceiling paint**.
2. **Isocyanates** are considered **respiratory sensitizers** by Collaborative on Health and the Environment. HDI, CAS# 822-06-0, found in **white board paint**, also carries the hazard statement **H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled** by EU - GHS. Isocyanates are commonly found in **spray foam insulation**, **single component spray foam sealants**, and **polyurethane sealants**.
3. **Halogenated flame retardants (HFRs)** can be PBTs and/or carcinogens. For example, Tris-(1,3-dichloro-2-propyl)phosphate (TDCPP), CAS# 13674-87-8, is listed as a **carcinogen** by California's Proposition 65. Hexabromocyclododecane (HBCD), CAS#s 25637-99-4 and 3194-55-6, is listed as a **PBT** by the EPA. HFRs as a class should be considered a concern unless a full assessment demonstrates a GreenScreen Benchmark 2 or higher. HFRs are present in **expanded polystyrene**, **extruded polystyrene**, **polyisocyanurate** and **spray foam** insulation.
4. **Formaldehyde-based binders** (e.g. urea-formaldehyde, phenol-formaldehyde and melamine-formaldehyde) can **release formaldehyde during product use**. Formaldehyde, CAS# 50-00-0, is listed as a **carcinogen** by numerous agencies including IARC. Urea phenol formaldehyde, CAS# 25104-55-6, based binders are found in mineral wool **batt** and **board** insulation, **fiber glass board insulation**, and **fiber glass pipe insulation**. Urea-Formaldehyde, CAS# 9011-05-6, based binders are found in **doors** and **high pressure laminate** (used for laminate countertops). Phenol formaldehyde, CAS# 9003-35-4, based binders are used in **cabinetry**.
5. Many **Hydrofluorocarbons (HFCs)** are considered to have a **high global warming potential (GWP)** by the EPA, such as HFC 245FA CAS# 460-73-1 and HFC 134A CAS# 811-97-2, which have $GWP \geq 1000$. HFCs are present in **spray foam insulation** and **XPS insulation**.

Newer, alternative blowing agents, Hydrofluoroolefins (HFOs), used in some foam insulation products are **produced** using carbon tetrachloride, CAS# 56-23-5, a **carcinogen** per Prop 65 that is also a **potent ozone depleter (ODP)** with a **high GWP** per the EPA.
6. **Per and polyfluorinated alkyl substances (PFAS)/ Perfluorinated Compounds (PFCs)**, are highly persistent chemicals. They can meet GreenScreen Benchmark-1 criteria for a persistent bioaccumulative and toxic substance (PBT) (which includes very persistent toxicants (vPT), very bioaccumulative toxicants (vBT) and very persistent, very bioaccumulative substances (vPvB)). For example, **perfluorooctane sulphonate (PFOS) and its salts** are considered **PBTs** per OSPAR. For a more specific example, perfluorohexanoic acid, CAS# 307-24-4, is **very persistent and toxic (vPT)** per a GreenScreen Assessment completed by ToxServices, LLC. PFAS/PFCs as a class should be considered a concern unless a full assessment demonstrates a GreenScreen Benchmark 2 or higher. Perfluorohexanoic acid is found in **natural stone countertop sealants**. PFAS can also be present in **broadloom carpet** and **carpet tile**.
7. **Bisphenol A (BPA) based chemicals and polymers** may contain and/or release BPA. BPA, CAS# 80-05-7, is on the EU Substances of Very High Concern (SVHC) list due to **endocrine disrupting properties**. BPA related compounds are found in **epoxy flooring adhesive** and **fluid-applied flooring**.
8. **Polyvinyl chloride (PVC) and related polymers**, are high volume materials that require chemicals of concern in the manufacturing process. All **chlorine and vinyl chloride monomer production** uses mercury, asbestos and/or PFAS. Mercury is a **developmental toxicant** per Prop 65. Asbestos is a **carcinogen** per Prop 65. PFAS/PFCs are persistent chemicals. PVC is found in **vinyl sheet flooring**, **vinyl composite tile**, and **luxury vinyl tile**.
9. **Orthophthalates** can be **developmental toxicants** per the US National Toxicology Program. Orthophthalates can be found in **silyl-terminated polyether (STPE)** and **polyurethane** sealants. Orthophthalates can also be found in some acrylic and siliconized latex sealants, though they are no longer common in these product types.
10. Cyclosiloxanes, **Octamethylcyclotetrasiloxane (D4)**, CAS# 556-67-2, **Decamethylcyclotetrasiloxane (D5)**, CAS# 541-02-6, and **Dodecamethylcyclohexasiloxane (D6)**, CAS# 540-97-6, are all considered **PBTs** by multiple sources including the EU SVHC. Cyclosiloxanes can be found in **silicone sealants**.
11. **Polycyclic aromatic hydrocarbons (PAHs)** are **carcinogens** per MAK. PAHs can be found in **coal tar sealants**.
12. **Organotin compounds** can be reproductive toxicants. For example, dibutyltin dilaurate, CAS# 77-58-7, is a **reproductive toxicant** per the EU Annex VI harmonized classification. Organotins are used as catalysts in the manufacture of polyurethane systems including polyurethane **spray foam insulation**, **sealants**, and **adhesives**. They are also used in some **silicone** and **STPE** sealants and PVC products.
13. **Arsenic and arsenic compounds** are **known human carcinogens** per EPA. Arsenic based biocides are used in building products. For example, 10,10'-bis(phenoxyarsinyl)oxide, CAS# 58-36-6 is a biocide commonly found in **silicone sealants**. Chromated copper arsenate (CCA) treated wood was **voluntarily phased** out for most residential uses, however, it is still available for use in commercial and industrial applications.
14. Heavy metals are defined, for the purposes of this target list, as compounds containing **arsenic**, **cadmium**, **hexavalent chromium**, **lead** or **mercury**. These compounds all have multiple hazards associated with them. For example, arsenic based compounds, cadmium based compounds, and hexavalent chromium based compounds are **known human carcinogens** per multiple sources including EPA. Lead compounds are **developmental and reproductive toxicants** per EPA and lead and mercury compounds are **PBTs** per EPA. Fly ash, found as recycled content in **carpets**, can contain arsenic, mercury, cadmium and lead. **Recycled glass** can contain lead and mercury. **Recycled PVC** has been shown to contain lead and cadmium. **Recycled tires** used in flooring may contain lead.

Key

The icons in the table represent the hazards associated with the target chemical, a degradation product, analogous chemical, or process chemicals used to manufacture the target chemical as described in the endnotes.



= Carcinogenicity or mutagenicity



= Respiratory sensitizer or priority asthmagens



= Reproductive toxicity, developmental toxicity, or endocrine activity.



= Ozone depletion or global warming potential



= Meets GreenScreen Benchmark-1 criteria for a persistent bioaccumulative and toxic substance (PBT) including very persistent toxicants (vPT), very bioaccumulative toxicants (vBT) and very persistent, very bioaccumulative substances (vPvB)