Supplementary Information (SI) for Environmental Science: Advances.

Common Product Methodology

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A Common Product profile (CP) is a type of data record that is not specific to any manufacturer, but lists the substances that are most commonly present in a product type, the percent by weight, the function the substance serves in the product, health hazard information of the substance, and the source data cited. It is generated by reviewing a diversity of publicly available data on the product type. Common Products are hosted on Pharos, a database developed by Habitable for identifying health and environmental hazards associated with chemicals, materials, and building products.[1]

The Common Product database is intended to be an educational and actionable source of information for those who are looking to more deeply understand human and environmental health implications of a variety of building products on the market.

Components

Every Common Product profile includes the following:

Table 1: Components of a Common Product profile

Name	The most common way of referring to the product type
Description	A written summary of the product information, such as the composition, how the product is made and/or installed, key environmental or human health attributes, and/or any assumptions made in defining the CP, as well as references to relevant standards (ASTM, ANSI, etc.) used in determining the boundaries of the product's content. If an older version of the CP exists, the description also contains a link to the previous version.
Common Contents	A list of the product's most common contents, (including residuals or impurities when they are known content of the finished product) with the associated information when applicable: CASRN, percent weight within overall product and within any subcomponents of the product, function or role within the product, GreenScreen® Benchmark or List Translator

	score, sources (citations), and additional notes.
All Contents	A list of both common content and additional less commonly referenced content that may be present in the product type, with the associated information when applicable: CASRN, function or role within the product, GreenScreen® Benchmark or List Translator score, sources (citations), and additional notes. This represents all potential content identified in our research, but does not necessarily include all chemicals and materials that may be used by all manufacturers.
Process Chemistry	Chemicals used or created during manufacturing. Information is provided in two sections: ● "Known or Potential Residuals" lists the upstream process chemicals that our research indicates are used to synthesize the common chemicals in the CP, and are more likely to be present as residuals in the product. It also includes additional potential residuals for the product type specifically, as identified in the CP research. ● "Other Process Chemicals" lists the upstream process chemicals that our research indicates are used to synthesize the common chemicals in the CP, but are less likely to be present as residuals in the finished product.

Data Sources

Publicly available documents are reviewed to inform the composition of each Common Product. Content included in the Common Product is appropriately cited with a list of sources from which the information was derived. This includes sources used to determine the common substance or material as well as percentages and functional use. Additional sources that contributed to defining any other part of the profile are also cited.

Common Product sources are obtained by first identifying manufacturers and industry associations associated with a given product type via an internet search. Manufacturer and

trade association websites are searched for technical documents such as safety data sheets, technical data sheets, Environmental Product Declarations (EPDs), and product catalogs. Trade Association documents may include technical reports that include typical product composition and installation guidelines. For instance, to determine the composition of ready-mixed concrete under a specific set of conditions and specified to a given compressive strength we referenced ACI 211.1-91 (American Concrete Institute, Farmington Hills, MI). In some cases ASTM standards may be reviewed (ASTM International, West Conshohocken, PA). For example, to determine the maximum amount of impurities that may be present in concrete aggregates we reviewed ASTM Standard C33/C33M-18. We also search public databases hosting building product transparency documents. These include the HPD Public Repository (Health Product Declaration Collaborative, Wakefield, MA), and the Declare database (International Living Future Institute, Portland, OR). For some CPs we conduct a literature search that includes identifying relevant peer-reviewed journal articles, government reports, or book chapters written by technical experts from industries relevant to a particular product type or chemical process, such as those found in Ullmann's Encyclopedia of Industrial Chemistry. For some CP research we search additive manufacturer sites to identify chemical additives marketed for use in a particular product type. Patents are searched as a supplement to these data sources, and to verify that all functions typically used in a given product type are accounted for.

Because product compositions change frequently, recent sources are preferred over older sources. When no CASRN for a particular chemical is provided in a source, Pharos is used to identify CASRN based on chemical names. Pharos is also used to identify the primary CASRN for a chemical substance that may have multiple CASRNs associated. If a CASRN is not identified in Pharos, we search PubChem to identify the CASRN. If neither source returns a CASRN, we conduct an internet search to determine whether or not a CASRN is provided for a chemical being marketed, with the same substance name, for use in the given product type.

Determining Common Product Composition

The Common Product database contains a "generic" composition for each CP, as opposed to a manufacturer-specific composition. The material or substance most commonly cited for a given function is included in the "Common Contents", with a minimum requirement of two sources citing use of that material or substance. If multiple substances for a given function are cited with two or more sources each and product literature indicates that only one material would be used for a given function, the material with the greater number of citations is included. If multiple substances are cited with equal frequency, the substance

most frequently found in formulations associated with the other content determined to be common is included. The final percent weight of each material or substance must be within the range reported by the sources reviewed. See below for criteria used to determine which functions, materials, and chemicals are considered common content and methods for quantifying percent weight.

In some cases a function is cited by multiple sources, but no specific chemical identity is given or no specific chemical is cited in multiple sources. In these cases, a single source may be used to identify a CASRN for that function. The substance is then flagged in the notes field as a representative CASRN indicating that while the function was found to be common, the CASRN itself was not found to be common.

The vocabulary used for describing different components of a Common Product are consistent with terms used in existing standards and assessments, as identified by the Material Health Harmonization Task Group.[2] The Material Health Harmonization Task Group (HTG) includes Business and Institutional Furniture Manufacturers Association (BIFMA), Cradle to Cradle Products Innovation Institute (C2CPII), GreenScreen/Clean Production Action (CPA), Habitable, and the Health Product Declaration Collaborative (HPDC). This group was funded by the US Green Building Council to map the similarities and differences between the various programs and work towards synergies through inter-program harmonization and data sharing.

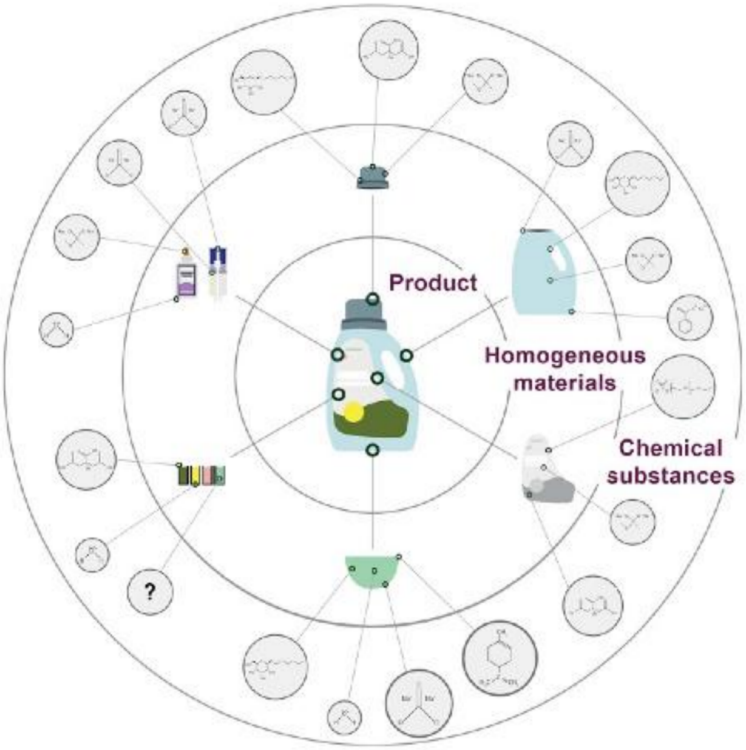

Figure 1: Primary product taxonomy (image adapted by Material Health Harmonization Task Group, originally sourced from Cradle to Cradle Products Innovation Institute)

Common Content

Criteria for Inclusion

Contents are included in the Common Product profile if they meet the following disclosure thresholds:

- ***Homogeneous materials*** are eligible for inclusion as common content if present in quantities ≥ 0.01% (100 ppm) of the overall product mass AND cited in two or more sources. If a material is listed in a trade association document or other source that represents more than one manufacturer, the material is eligible for inclusion in the Common Product profile without additional sources.
- ***Chemical substances*** are eligible for inclusion as common content if present in quantities ≥ 0.01% (100 ppm) of the material's mass. The same sourcing requirements for inclusion as common content apply as for homogeneous materials.

- ***Contents below these thresholds*** are included if they:
    - Are asthmagens (respiratory health endpoint), carcinogens, mutagens, reproductive or developmental toxicants, endocrine disruptors, or persistent bioaccumulative toxicants (PBT) per Pharos health hazard data, or
    - Contain impurities that meet the above hazard requirements. For CPs completed prior to 2020, only asthmagens, carcinogens, and PBTs met the hazard criteria for inclusion.
    - NOTE: In most cases, there is not enough information to identify chemicals below the threshold.

Quantification

The mass percentage of each material or substance is derived by taking a median of the quantities identified across all sources. Most sources report mass percentage as a range. All values reported for a chemical or material are included in the median calculation, including the minima and maxima of the ranges reported. Sometimes the lower bound of the reported range is reported as zero. In these cases, only the upper bound of the reported range is included in the calculation since including the lower bound could result in reporting a median concentration of zero. We rationalize this adjustment based on the assumption that the content is being reported because it is present in the product. Once all likely functions have been accounted for, the common content percentages are summed and normalized to total 100%. After normalization, if the concentration of any substance exceeds the maximum concentration reported by the sources, its percent weight is manually adjusted to equal the maximum value reported across all sources. If the concentration of any substance is less than the minimum, non-zero concentration reported by the sources, its percent weight is manually adjusted to equal the minimum, non-zero value reported across all sources. The concentration of the other contents are normalized such that their sum equals the total of the remaining weight percentage of the product.

State

Composition is determined for each product based on its state as delivered to the job site; for example, paint applied on-site is characterized in its liquid state.

Recycled Content CPs

Several CPs have been generated to describe recycled content. For these records, the content represents the recycled material before it is incorporated into a product. Because recycled materials can be highly variable, all content with a minimum of two sources or one authoritative source is listed as common content, and the maximum weight percentages

identified are reported instead of the median. Notes may be included to indicate the origin(s) of the chemical content when it has been identified. Recycled content CPs were not included in this analysis.

Capturing High Concern Non-Intentionally Added Substances (NIAS)

The CPs also capture non-intentionally added substances (NIAS) when appropriate, as dictated by the following methodology:

Identification

NIAS, including residuals from processing and contaminants from raw materials, are identified using Process Chemistry Research as reported in Pharos or other sources. The Process Chemistry Research assesses substances used in or produced during the manufacturing process, including reactants, catalysts, solvents, by-products, and process aids, as well as contaminants or pollutants commonly found in the materials or substances. Process Chemistry research relies on publicly available documents similar to those used in Common Product research.

Criteria for Inclusion

Process chemistry identified in the Pharos database for chemicals that are listed as common content is reported in the “Process Chemistry” tab of the CP. Additional process chemistry identified in the CP research that is related to the relevant product type, but not to any specific chemical, may also be reported here. NIAS with sufficient data to indicate they are present in the finished product and can be quantified are listed as content (e.g. limestone commonly contains quartz as an impurity, so products containing limestone will commonly contain quartz in the common content).

Quantification

Mass percentages for impurities within the product are quantified if data is available. Quantities come from (a) aggregated data provided by industry trade associations or government authorities, or (b) a minimum of two independent sources. Impurities that are common and quantifiable are listed in the common content. Impurities that cannot be quantified are included in the Process Chemistry and the mass percentage is listed as “unknown”. Once quantified, the same threshold rules apply for the inclusion of impurities as for the intentional content detailed above.

Inferring composition

Sometimes publicly available sources are insufficient for identifying discrete materials or substances used as part of a product beyond a general description. In such cases, a proxy

material or substance is used in the Common Product profile that matches the function of the unspecified content. For example, public information about coatings applied to the interior of sprinkler pipes describe them as “epoxy” with no further specificity. A CP for a general epoxy high-performance coating was used as the proxy for what might be used specifically in sprinkler pipes. A note is made describing this proxy use in the notes section.

Polymers

Lack of disclosure often occurs with polymers, whose identities are sometimes held as proprietary and only referenced using a general name within the product literature (e.g. acrylic polymer). In such cases, the identity of a given polymer is determined from patent information if possible. Patents often provide a formulation of ingredients that are reacted to form the finished polymer and can be used to identify common reactants. Similarly, sometimes transparency documents report these individual reactants in lieu of reporting the final polymer. These common reactants are listed as impurities. In addition, if the mass percentage of a polymer within a product is not available, it is estimated by adding the mass percentages of its reactants (such as monomers and crosslinkers) within the product. If the polymer’s specific name or CASRN cannot be identified, it is listed by its general name without a CASRN and “unknown” health hazards.

When no common reactants are known but a representative polymer is identified (i.e., no specific polymer is identified as common, but one source references a specific CASRN), the identified polymer is included as a representative polymer and a note is made in the notes field to identify it as such.

When no common reactants are known and no representative CASRN is identified, the polymer is listed by its general name without a CASRN. No residual information is included unless it is available from product literature. The health hazards are “unknown”.

All Contents

Throughout the CP research process, Habitable identifies a range of content that may be present in a product type. This includes chemicals for functions that were not found to be common and alternative chemicals for common functions in the CP. This additional information is included in the Common Product record in Pharos in the “All Contents” tab. This content is not necessarily representative of all chemicals and materials that may be used by all manufacturers and should not be used as a replacement for a specific manufacturer's product disclosure.

Common Product Health Hazard Screening

About Health Hazard Screening

A variety of state, national, and international governmental bodies and non-governmental organizations (NGOs) maintain authoritative chemical hazard lists. These are lists of substances for which an authoritative body of scientists has undertaken a review of scientific evidence and categorized the substances as having a specific health hazard. There is currently no single, comprehensive authoritative list or database that assesses and rates all chemicals across all human health hazard endpoints. Pharos begins to address this problem by combining many single hazard endpoint lists into one combined database that provides a view across multiple endpoints.

Health Hazard Screening of Common Products

Health hazard data from Pharos is used to screen the chemical substances within the CPs to determine if the substances have been associated with a health concern by an authoritative body. The GreenScreen® for Safer Chemicals Benchmark or List Translator score is displayed next to each chemical in the CP profile.[3] Additional hazard data from dozens of authoritative hazard lists from Pharos can be accessed by clicking on the chemical itself. The screenings do not include a risk or exposure assessment.[4] .

Citations

(1) Habitable. Pharos, 2025. https://pharos.habitablefuture.org/.
(2) Material Health Harmonization Task Group. Material Health Evaluation Programs Harmonization Update, 2015. https://www.usgbc.org/resources/material-health-evaluation-programs-harmonization-update-0 (accessed 2025-04-28).
(3) Clean Production Action. Greenscreen® for Safer Chemicals Hazard Assessment Guidance. Version 1.4, 2018. https://www.greenscreenchemicals.org/images/ee_images/uploads/resources/GreenScreen_Guidance_v1_4_2018_01_Final.pdf.
(4) Habitable. Pharos System Description, 2024. https://pharos.habitablefuture.org/files/pharos-cml-system-description.