From Standard to Safe:

Investigating Harmful Materials and Healthy Alternatives for Multifamily Affordable Housing

MAP

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NYSERDA Buildings of Excellence Early Design Support Program

In an effort to guide the construction industry towards a carbon neutral future, the New York State Energy Research and Development Authority (NYSERDA) launched its Buildings of Excellence Early Design Support program in 2022. Expanding on the successes of the original Buildings of Excellence work funding demonstration projects, this initiative sponsors research to help development and design teams reduce energy use, achieve carbon-neutral performance, and incorporate resilient, clean, functional design. This study, produced through NYSERDA's Early Design Support program, explores healthy, Red List-free material options for an affordable senior housing development in New York City called Sol on Park. It is among several reports centered on Sol on Park and funded through the Early Design Support program that also include a Passive House feasibility study, an energy recovery ventilation (ERV) analysis, a waste management design report, and a comprehensive cost and constructability comparison of three different all-electric mechanical heating and cooling systems.

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Executive Summary

Many materials commonly used in construction contain toxic chemicals that pose significant threats to human health and the environment throughout their entire life cycle. Widely used building products like paint, insulation, and flooring can contain known carcinogens, for example, or emit pollutants that negatively impact indoor air quality. Even materials that are safe for the final occupants often emit substantial greenhouse gases and chemical pollution during production and disposal. Despite the health implications inherent to the material selection process, it is difficult to reliably source sustainable and non-toxic products in the present market. Transparency varies tremendously by manufacturer, and the chemical makeup of a particular product is not always easy to determine.

To evaluate how affordable housing developments can integrate safer materials, Magnusson Architecture and Planning (MAP) conducted a study using funding from NYSERDA's Buildings of Excellence Early Design Support program, an initiative that sponsors building projects designed to achieve carbon-neutral performance while providing safe, healthy, and comfortable living environments. Using a senior housing development called Sol on Park as an example, this study identifies harmful chemicals commonly found in affordable multifamily buildings and explores healthy alternatives. This was done in large part through participation in Living Future's Safer Materials Shift cohort. The 18-month program aimed to help design teams reduce their use of toxic products by avoiding substances on the organization's Red List, a compilation of "worst in class" chemicals that pose serious risks to human health and the environment. Additionally, MAP conducted both an embodied carbon analysis and a holistic product comparison to supplement the Safer Materials Shift research and gain a broader understanding of the factors that contribute to material health.

The project, Sol on Park, will provide 228 units of affordable senior housing to the Bronx and house important community facilities including a Federally Qualified Health Center, a meeting space for the NYCHA Tenant Association center, and an urban agriculture center. The development was designed as a model for healthy, sustainable living and is planned to achieve LEED Platinum v4 Multifamily Midrise, Energy Star Multifamily New Construction, and Fitwell Level 3 certifications.

Key Findings

Red List Free Alternatives

Living Future's Safer Materials Shift process was designed to encourage project teams to take small, manageable steps towards incorporating healthier products, rather than tackling outright the formidable task of eliminating all Red List chemicals from a building. The program divided material categories commonly used in multifamily affordable housing developments, such as flooring or insulation, into two separate classifications: Type 1 and Type 2. Type 1 material categories are those that have Red List Free or Approved product options readily available, while Type 2 material categories are more difficult to source as Red List Free or Approved.

By following the research and product vetting process outlined by Safer Materials Shift, MAP was able to specify Red List Free or Approved product options for 100% of Type 1 categories and 25% of Type 2 categories. This was a significant improvement over the project's initial baseline specifications, in which just 68% of Type 1 categories and 20% of Type 2 categories had a Red List Free or Approved option.

Embodied Carbon Analysis

Among Sol on Park's specified products for which there were Environmental Product Declarations (EPDs) available, this analysis found a negative correlation between Red List Free or Approved products and embodied carbon. Products that contain Red List ingredients often have higher embodied carbon impacts than those without because many Red List chemicals are or are derived from fossil fuels – in Sol on Park's baseline specifications, the most common Red List and Priority List chemicals were formaldehyde and petroleum, respectively. This implies a strong link between the healthy materials economy and decarbonization efforts, indicating that limiting the production of Red List chemicals will support climate change mitigation goals.

Holistic Product Comparison

Just because a product is Red List Free or Approved does not mean it is automatically the best choice within its class. To gain a more thorough understanding of material health beyond Red List status, MAP analyzed Sol on Park's specifications using Habitable's Informed Product Guidance, a resource that evaluates materials based on human and environmental impacts at all life cycle stages. The analysis is organized by material type (e.g. insulation or adhesives) and ranks product options within each type using the Informed Product Guidance framework. This exercise, though not intended to produce definitive selections for the final building, helped MAP critically compare the benefits and drawbacks of each product type and build a more comprehensive foundation around which to shape future material selection practices.

Conclusions

The healthy materials economy has a long way to go. Many building materials currently have no Red List Free or Approved options available, while some prominent manufacturers have released eco-friendly lines but have yet to standardize safe, sustainable practices. Even when Red List Free options exist, lack of availability at the local level and the absence of widespread ingredient disclosure can be major barriers to responsible material choice.

Still, this study demonstrates that significant improvements can be made despite current market limitations. Research at this scale is not necessary for every project – steps as simple as requesting transparency documentation or investigating the feasibility of several non-toxic products will help to cultivate a market for safer materials. Industry-wide advocacy for better practices and standards, as well as efforts to enhance product options and availability, will result in healthier communities across the globe everywhere that building materials are extracted, manufactured, used, and deconstructed.

Introduction

There are 86,228 chemicals available for commercial production in the United States, and 40,655 of them are actively in use.[1] It is well documented that many of these chemicals pose significant threats to human and environmental health,[2] but the majority underwent no long-term safety testing before appearing on the market.[3] To address this, a 2016 amendment to the Toxic Substances Control Act introduced a process through which the safety of existing chemicals would be evaluated and their risks managed.[4] To date, only 38 chemicals have begun the process.[5] As the regulatory environment lags, transparency among product manufacturers, informed choices by consumers, and industry-wide advocacy for healthier product alternatives are critical.

This issue is especially urgent in the construction industry, where common materials often include toxic chemicals.[6] For example, chemicals used in paints, solvents, adhesives, and other products can negatively affect indoor air quality[7] and cause health outcomes like asthma and respiratory disease in both residents and construction workers.[8] Many widely used building products contain known carcinogens and chemicals with harmful endocrine-disrupting properties.[9] Even materials that are safe for the final occupants can emit significant greenhouse gases and chemical pollution during production and disposal.[10] As research continues to reveal the adverse effects of the materials and products we use, standard practice must evolve accordingly. The removal of hazardous chemicals from construction has precedent; for instance, the successful elimination of substances like asbestos and lead-based paint has noticeably improved the safety of the built environment.[11]

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[1] US EPA, "EPA Releases First Major Update to Chemicals List in 40 Years," January 10, 2022

[2] World Health Organization, "Chapter 5: Materials," Compendium of WHO and other UN guidance on health and environment, 2024.

[3] Department of Toxic Substances Control, "Chemicals of Emerging Concern," Ca.gov, 2021.

[4] US EPA, "Risk Evaluations for Existing Chemicals under TSCA," November 2016.

[5] US EPA, "Ongoing and Completed Chemical Risk Evaluations under TSCA | US EPA," US EPA, 2020.

[6] The New School: Parsons, "Healthy Materials Lab | HEALTH," 2018.

[7] American Institute of Architects, "How the Materials You Choose Affect Our Health," November 2023;

[8] Perkins&Will, "Healthy Environments: A Compilation of Substances Linked to Asthma," January 2017; Science & Environmental Health Network & WOLFE, "Asthmagens in Building Materials: The Problem & Solutions," Greenbuild International Conference And Expo, 2014.

[9] Enterprise Community Partners, "MATERIALS," Green Communities Criteria & Certification, 2020; National Center for Healthy Housing, "Potential Chemicals Found in Building Materials," 2010.

[10] The New School: Parsons, "Healthy Materials Lab | Chemicals, PFAS, the EPA and the Building Industry," 2024.

[11] NYC Housing Preservation and Development, "Lead-Based Paint - HPD," n.d; US EPA, "EPA Advances Enforcement Actions to Protect Communities from Hazardous Lead Paint," October 2023; US EPA, "Asbestos Ban and Phase-out Federal Register Notices," March 2013.

Healthy material choice is particularly important in affordable housing developments, as low-income populations have been disproportionately impacted by residential exposure to hazardous materials.[12] Despite the health implications inherent to material selection, it is difficult to reliably source sustainable and non-toxic products in the present market. Transparency varies tremendously by manufacturer, and the chemical makeup of a particular product is not always easy to determine.

To evaluate how affordable housing developments can integrate safer products, MAP conducted a study using funding from NYSERDA's Buildings of Excellence Early Design Support program, an initiative that sponsors projects designed to achieve carbon-neutral performance while providing safe, healthy, and comfortable living environments. Using a senior housing development called Sol on Park as an example project, this study identifies harmful chemicals commonly found in affordable multifamily buildings and explores healthy alternatives. This was done in large part through participation in Living Future's Safer Materials Shift cohort. The 18-month program aimed to help design teams reduce their use of toxic products by avoiding substances on the organization's Red List, a compilation of "worst in class" chemicals that pose serious risks to human health and the environment.[13] Additionally, MAP conducted both an embodied carbon analysis and a holistic product comparison to supplement the Safer Materials Shift research and gain a broader understanding of the factors that contribute to material health.

[12] CDC, "People at Increased Risk for Childhood Lead Poisoning," June 4, 2024; Robin E. Dodson et al., "Chemical Exposures in Recently Renovated Low-Income Housing: Influence of Building Materials and Occupant Activities," Environment International 109, 2017; Gary Adamkiewicz et al., "Moving Environmental Justice Indoors: Understanding Structural Influences on Residential Exposure Patterns in Low-Income Communities," American Journal of Public Health 101, no. S1, 2011.

[13] In addition to the Red List, several other curated resources including the Green Science Policy Institute's Six Classes of Harmful Chemicals, Perkins&Will's Precautionary List, and Cradle to Cradle's Restricted Substances List identify hazardous chemicals and encourage manufacturer transparency.

Project Overview

Sol on Park was the winning development for the Morris Houses Seniors First Request for Proposals (RFP) issued by the New York City Department of Housing Preservation and Development (HPD) and the New York City Housing Authority (NYCHA) in 2020. It will bring 228 units of affordable senior housing to the Bronx and house important community facilities including a Federally Qualified Health Center, a meeting space for the NYCHA Tenant Association center, and an urban agriculture center. The building is planned to achieve LEED Platinum v4 Multifamily Midrise, Energy Star Multifamily New Construction, and Fitwell Level 3 certifications.

Figure 1:
Sol on Park with angled floorplates

Inspired by the Catalan Architect Jose Antonio Coderch de Sentemat, whose housing masterpiece Girasol turned individual units to face toward the sun like a sunflower, Sol on Park adopts a similar angled orientation that facilitates better exposures, views, and natural ventilation, as well as cascading roof terraces and gardens, a large pedestrian plaza, two floors of community spaces and programs, and ample opportunities for access to the outdoors. Sol on Park's unique architectural design is not only visually striking, but pragmatic. A simple variation on this typology's typical studio unit, the floor plan creates

better spaces for seniors by providing natural light and ventilation, access to open space, and areas to congregate in smaller groups to encourage socialization and active circulation.

Sol on Park will have a high-performance envelope and the apartments will be heated and cooled by cold-climate packaged terminal heat pumps (PTHP). Building amenity spaces will be heated and cooled by VRF heat pump units. Ventilation will be provided to the apartments by exhaust and to the residential corridors by energy recovery ventilators. Building domestic hot water will be furnished by a central electric air source heat pump plant.

Tremendous attention was paid in making the construction system as simple as possible, essentially adopting a "kit-of-parts" methodology using standard materials, types, and sizes. The construction approach involves a cast-in-place concrete base for the two ground floors and concrete plank over structural steel for the upper floors. By rotating the structural steel grid and changing the orientation of the concrete planks, the team was able to lay out the entire structural system with virtually zero field cuts. The façade system consists of prefabricated wall panels that incorporate the cladding, glazing, spandrel panels, and grilles, decreasing time spent on site and avoiding the embodied carbon impact associated with site-built wall construction.

Project Team

- **The NRP Group** is the lead developer and construction manager. The NRP Group is a vertically integrated developer, builder, and manager of best-in-class multifamily housing that creates both affordable and market-rate homes.
- **Selfhelp Realty Group** serves as co-developer and will provide social services and job training in concert with its affiliate, Selfhelp Community Services. Selfhelp is one of the largest not-for-profit senior service agencies in the New York metropolitan area and has been building senior communities since 1963.
- **Foxy Management** serves as co-developer and management agent. Foxy is a Bronx-based developer and manager specializing in affordable, supportive, and senior housing.
- **Magnusson Architecture and Planning (MAP)** is the project architect.
- **Touchstone Builders** is the general contractor.
- **Ettinger Engineering Associates** is the MEP engineer.
- **Bright Power** is the sustainability consultant.

Study Background

The Living Building Challenge (LBC), developed by Living Future, is a stringent certification program for regenerative and sustainable buildings. The LBC framework is organized into seven categories, or "Petals," that each address a different component of sustainable design: Place, Water, Energy, Health + Happiness, Materials, Equity, and Beauty. Each petal is further divided into specific, performance-based "Imperatives." There are 20 total Imperatives throughout LBC.

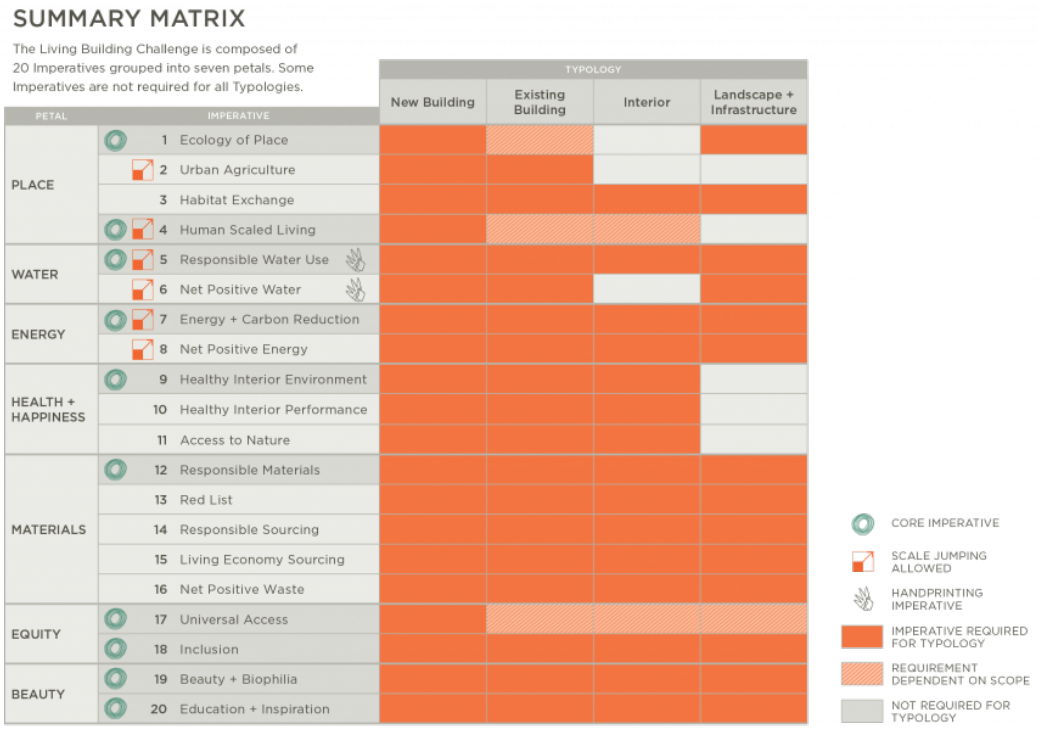


Figure 2: Living Building Challenge Summary Matrix (image by Living Future)

Imperative 13 within the Materials Petal requires the avoidance of products on the LBC Red List, which compiles the "worst in class" chemicals that pose serious risks to human health and the environment. The Red List is curated based on national and international chemical hazard criteria as identified by GreenScreen.[14] Human health hazards include carcinogens and substances with mutagenic, reproductive, developmental, and endocrine toxicity. Environmental hazards include substances that are persistent, bioaccumulative, and toxic. The Red List is updated annually by Living Future's Material

[14] GreenScreen for Safer Chemicals, developed by the nonprofit organization Clean Production Action, is a hazard assessment tool that promotes the design and use of safer chemicals via informed substitution.

Health Technical Advisory Group. It is organized by chemical class as a precautionary approach intended to discourage the replacement of toxic chemicals with equally harmful substitutes.

To accomplish Imperative 13, 90% of a project's new materials must be LBC compliant, which means they are either "Red List Free" or "Red List Approved." Red List Free products must disclose 100% of ingredients plus residual chemicals from the manufacturing process that are present at or above a concentration of 100 ppm (parts per million). Red List Approved products may contain one or more Red List chemicals if they fall under one of the exceptions established in the LBC Program Manual and must disclose at least 99% of ingredients plus residuals present at or above 100 ppm. These exceptions are meant to address product categories that are currently limited in their ability to remove all Red List chemicals due to market availability of ingredient alternatives or building code requirements. In addition to the Red List, Living Future has developed an LBC Priority List and Watch List to identify chemicals prioritized for inclusion on the Red List and considered for inclusion on the Red List, respectively. There are currently 12,574 chemicals on the Red List, 10,704 on the Priority List, and 147 on the Watch List.

While the Red List is a thorough and rigorous resource, it is not a full life cycle review of all substances involved in a product's use. Chemicals used during extraction, processing, and manufacturing are not tracked, so although the elimination of Red List chemicals is a significant step towards healthier materials, it does not guarantee safety. Additionally, not all substances have thorough hazard assessment data available yet, so there may be chemicals not included in the Red List that would meet its criteria if fully assessed.[15]

Safer Materials Shift Cohort

In 2024, Living Future launched Safer Materials Shift, an 18-month program designed to help the affordable housing industry reduce the use of Red List products. MAP, along with nine other development and design firms throughout the United States, participated in the cohort, which involved tracking and sharing information about the materials used in their projects. The program divided product categories commonly used in affordable housing developments into two separate classifications: Type 1 and Type 2. The product categories that fall into the Type 1 classification are those that have Red List Free or Red List Approved options readily available, while the product categories classified as Type 2 are more difficult to source as Red List Free or Approved due to availability or cost.

[15] For more details about LBC and its requirements, see International Living Future Institute, "Living Building Challenge 4.0," 2019. For the most comprehensive and up-to-date information, the full program manual can be requested from Living Future's website.

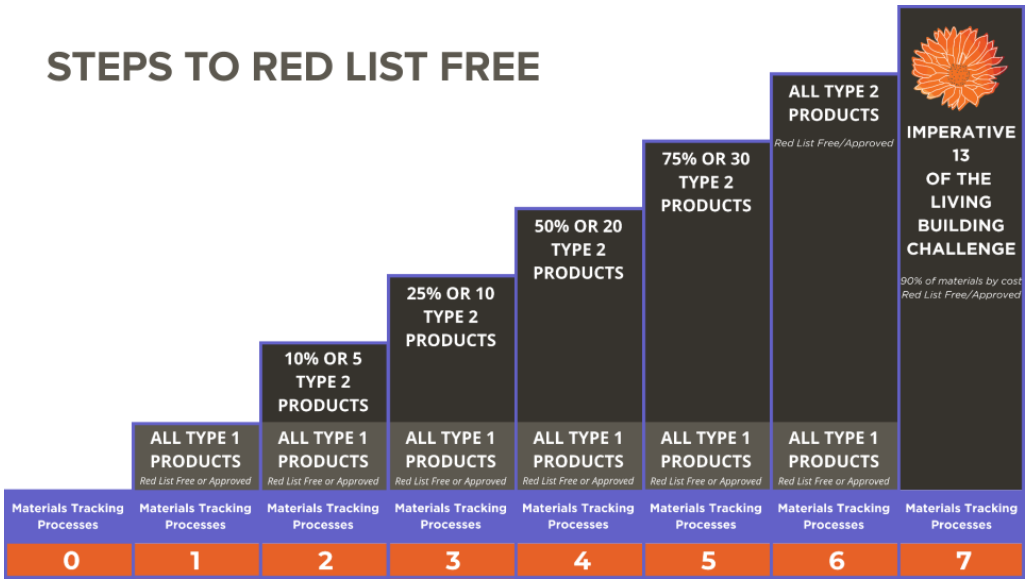
Table 1:
Safer Materials Shift product categories

Type 1	Type 2
Concrete Masonry Solid Wood Members Insulation Products Gypsum Board Ceramic Tile Acoustic Ceiling Tile Acoustic Treatment Carpet Paints & Coatings* Weatherproofing & Vapor Barriers	Metals Composite Wood Duct Insulation Dampproofing & Waterproofing Roofing & Siding Applied Waterproofing Storefront Resilient Flooring Window Treatments Casework Countertops Plumbing Fixtures & Piping Lighting Adhesives & Sealants Mortar & Grout Doors Windows Paints & Coatings*

*Interior paints are Type 1, however other paints such as metal coating are considered Type 2

Additional product categories that did not fall into the Type 1 nor Type 2 designation were beyond the scope of this project. Of the building's 50 total specification categories, 17 (33%) were neither Type 1 or Type 2. These generally included equipment-related or miscellaneous accessories such as residential appliances, waste compactors, and bicycle racks. Although they were not part of the study, we investigated six of these additional categories and found that confirmed Red List Free alternatives were extremely difficult to find.

Figure 3:
Steps to Red List Free graphic (image by Living Future)



For Safer Materials Shift, Living Future used these product categories to establish seven milestone steps along the path to full Red List compliance:

- Step 1: All Type 1 product categories have a Red List Free or Approved product specified
- Step 2: All Type 1 product categories and 10% or 5 Type 2 product categories have a Red List Free or Approved product specified
- Step 3: All Type 1 product categories and 25% or 10 Type 2 product categories have a Red List Free or Approved product specified
- Step 4: All Type 1 product categories and 50% or 20 Type 2 product categories have a Red List Free or Approved product specified
- Step 5: All Type 1 product categories and 75% or 30 Type 2 product categories have a Red List Free or Approved product specified
- Step 6: All Type 1 product categories and all Type 2 product categories are Red List Free or Approved product specified
- Step 7: 90% of all product categories used in the built project have a Red List Free or Approved product specified

Because the Safer Materials Shift program was aimed at buildings still in early design, these percentages were based not on the final products used in construction, but on the project's architectural specifications. If a project participating in Safer Materials Shift was 100% Red List Free, that would mean that every product category in its specification included at least one Red List Free option. For example, if the "concrete" product category initially specified three options and none of those options were Red List Free, this category is not Red List Free. However, if during the research process a fourth Red List Free cement option was found and added to the specification list, the cement category would then be considered Red List Free.

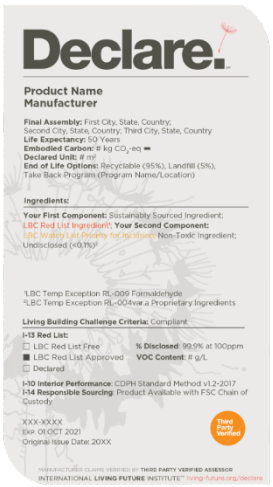
Red List Free products within the Type 2 categories are more difficult to source than Type 1, so these steps provide a pathway for designing a healthy building by first ensuring that all Type 1 product categories have a specified Red List Free option and then gradually integrating more such options within the Type 2 classification. Successful completion of all steps represents the fulfillment of Imperative 13 of the Materials Petal.

Methodology

MAP closely followed the process outlined by Living Future's Safer Materials Shift program to identify all Type 1 and Type 2 product categories specified for Sol on Park, vet the products within these categories for Red List chemicals, and research Red List Free

alternatives when applicable. In addition to determining whether a product contained Red List substances, we also chose to document each specific Red List, Priority List, and Watch List chemical present to investigate which toxic substances are most prevalent throughout affordable multifamily typology. To supplement the Safer Materials Shift project and better understand the human and environmental health implications of product choice, we conducted an embodied carbon analysis comparing Red List products with Red List Free alternatives and a detailed comparison of material options using Habitable's Informed Product Guidance framework.

Figure 4:
Declare Label



Vetting the Materials

All firms participating in the Safer Materials Shift cohort were given access to a shared spreadsheet for tracking details about their products. Sol on Park's initial specifications, which were chosen before this study began and informed by MAP's standard template (developed for multifamily typology in the greater New York City area), were first identified as Type 1, Type 2, or miscellaneous. Once all Type 1 and Type 2 products were listed, we reviewed the chemical contents of each to identify any ingredients on the Red List, Priority List, or Watch List. Chemical content was determined by first checking all available product declarations for ingredient information, and then reaching out directly to manufacturers whose products did not have sufficient publicly available documentation to establish Red List status. Within the building industry, there are several types of product declarations, most of them voluntary, that manufacturers can use to disclose the contents of their materials:

- **Declare Labels** are the most transparent form of voluntary product documentation currently available. They are administered by Living Future and require full ingredient disclosure including residuals at 100 ppm. Declare labels include information about a product's final assembly location, life expectancy, end-of-life options, and compliance with LBC requirements. Newer Declare labels even highlight Red List chemicals and Priority List chemicals in red and yellow, respectively.

- **Health Product Declarations (HPD)** are standardized documents for voluntarily reporting the contents of a product and their potential health impacts. Though HPDs do not require full disclosure, they must include the percentage of product ingredients that are undisclosed and the disclosure threshold in ppm. A manufacturer can also indicate if residual chemicals were screened. Associated health risks for undisclosed chemicals can still be listed even if the chemical

name is not included. Some newer HPDs note compliance with the Red List for individual chemicals.

HPDs can be third-party verified or self-published by the manufacturer. Because they do not require third-party verification or full ingredient disclosure, HPDs can vary in depth depending on what the manufacturer wishes to include. One benefit of HPDs compared to Declare labels is that an HPD highlights health hazards identified by different environmental agencies around the world, providing a broader perspective on the potential risks.

- **Safety Data Sheets (SDS)** disclose the most harmful chemicals contained within a final product and focus primarily on safety information regarding installation. They are required for chemicals classified as hazardous by the Occupational Safety and Health Administration's (OSHA) Hazard Communication Standard. Consumer products such as drugs, food, and cosmetics are exempt from this requirement if the label and other documentation are sufficient to allow safe use. Because they do not always provide the full composition or the disclosure threshold, Safety Data Sheets can only be used to help identify Red List chemicals, not to determine if a product is Red List Free.

- **LBC Compliance Letters** are unverified, voluntary documents stating that a product is Red List Free. Typically, manufacturers with LBC compliance letters have confirmed the product's avoidance of Red List chemicals internally with their lab but are unwilling or unable to disclose full ingredients (often due to proprietary information). This form of documentation should be used as a last resort because it does not encourage transparency.

- **Environmental Product Declarations (EPDs)** are documents that disclose the energy consumption, resource depletion, waste production, and embodied carbon impact of a product over the course of its entire life cycle. There is no universal EPD requirement, but they are increasingly becoming compulsory prerequisites for a variety of certifications, public funding sources, and inclusion in databases widely used by contractors for screening product specifications. Because this research centered on chemical content, EPDs were not prioritized for this study. Still, they were collected and reviewed, and we noted some interesting correlations between embodied carbon and material health which are recorded in this report.

To find product declarations, we first used Sustainable Minds and Ecomedes, two free online databases that compile available documentation about building materials. If no documentation was found through these platforms, we searched manufacturer websites. If a product still had no documentation or had documentation that was insufficient to determine Red List compliance, we reached out directly to the manufacturer to inquire about chemical contents.

Findings

Specifying Red List Free Alternatives

Through the course of this study, MAP accomplished Step 3 out of the 7 steps developed by Living Future for Safer Materials Shift, ensuring that for Sol on Park 100% of Type 1 product categories and 25% of Type 2 product categories had a Red List Free or Approved product specified. Our initial goal was to complete Step 1, which only involved specifying Red List Free options for 100% of all Type 1 product categories. However, as the research progressed, we saw that although Red List Free Type 2 products were harder to find, there were more options than we had expected.

Table 2 displays the proportions of Red List and Red List Free product categories in Sol on Park's initial specifications, calculated after a review of all readily available product information using Ecomedes, EC3, and manufacturer websites. This initial specification was created before reaching out directly to manufacturers and before researching and selecting Red List Free alternatives. It represents our understanding of Sol on Park's baseline material health according to all easily accessible product information. The "Inconclusive" row indicates product categories for which Red List chemicals could not be confirmed or ruled out by this preliminary review.

Table 2:
Initial specification statistics

	Type 1	Type 2	Total
Red List Free/Approved	68%	20%	40%
Inconclusive	20%	75%	52%
Red List	12%	5%	8%

Sol on Park had a strong baseline of Red List Free products from the start. The initial specifications included 237 products, and the review of readily available documentation

revealed that 40% of product categories had a Red List Free option, including 68% of Type 1 products and 20% of Type 2 products. Over half of all product categories were initially inconclusive, reflecting a general lack of voluntary ingredient disclosures and readily available transparency information.

After documenting the prevalence of Red List chemicals in Sol on Park's initial specification, we reached out directly to manufacturers of products for which our preliminary review was inconclusive. Over the course of the research, some manufacturers responded and were able to confirm the presence or absence or Red List chemicals.

If a product category from the initial specification was not Red List Free or was inconclusive with no manufacturer response, we researched and vetted alternative Red List Free options, considering constructability, aesthetics, agency requirements, and code compliance. Because this study was intended to be an exercise in sourcing healthy materials and familiarizing ourselves with the current market for non-toxic products, cost was not considered at this stage. A total of 40 alternatives were vetted. Table 3 indicates the amount of Red List and Red List Free product categories in Sol on Park's final specification. The final specification was created at the end of the research process for the purposes of this study and does not represent the final implemented specification list for the building.

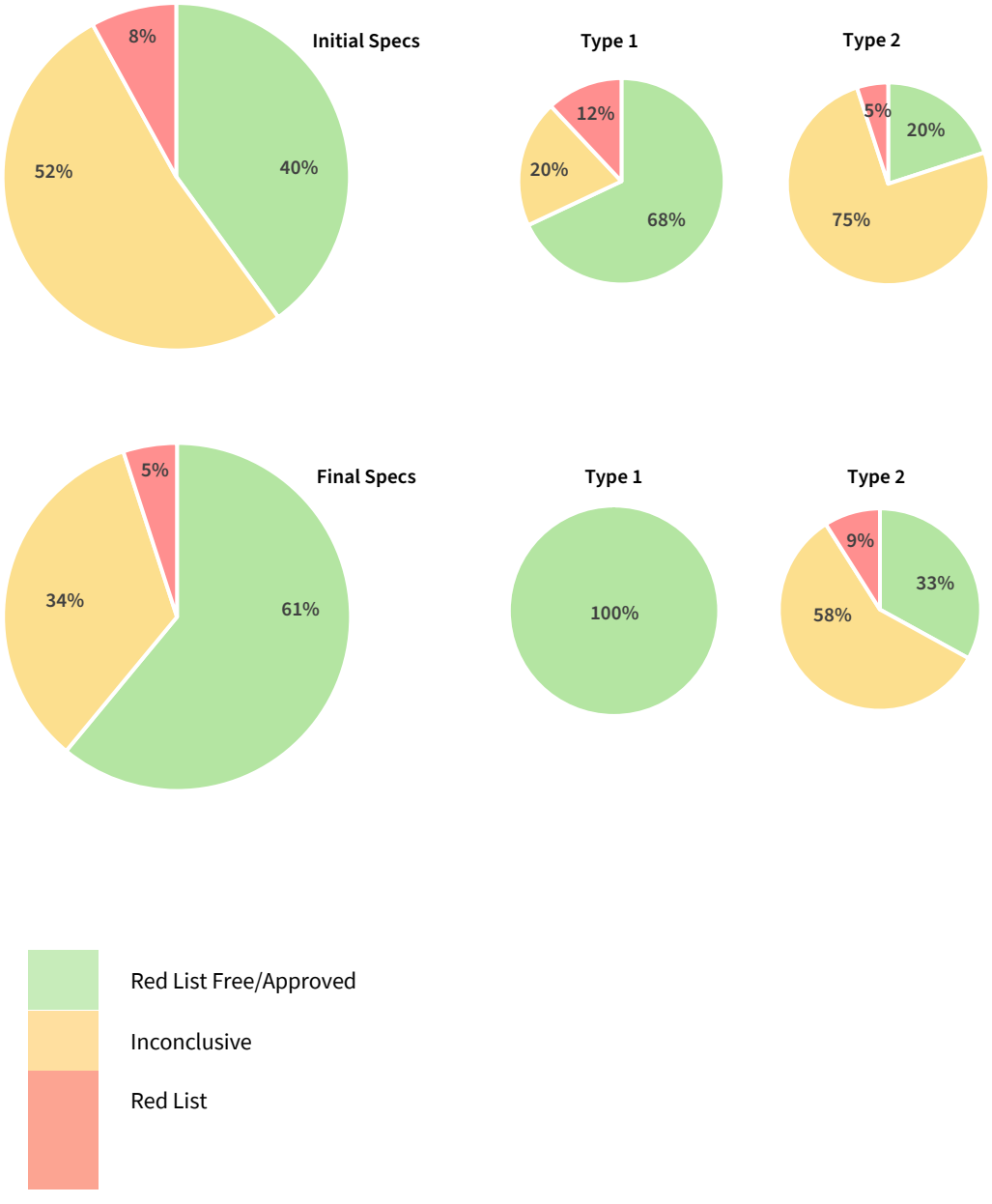
Table 3:
Final specification statistics

	Type 1	Type 2	Total
Red List Free/Approved	100%	33%	61%
Inconclusive	0%	58%	34%
Red List	0%	9%	5%

In the final specification, which included both initial specifications and vetted alternatives, 100% of all Type 1 products and 33% of all Type 2 products had at least one Red List Free or Approved option. Though this change can be attributed primarily to the addition of Red List Free alternatives, some products that were inconclusive in the original review turned out to be Red List Free after contacting the manufacturer, demonstrating the importance of further research when published transparency documentation is insufficient. Type 2 products had less readily available ingredient information and many manufacturers were unresponsive, resulting in a high percentage of inconclusive Type 2 categories by the end of the study. While Type 1 products were

typically easier to source Red List Free than Type 2 products, we found resilient flooring to be an exception. Despite its Type 2 status, there is a wide range of healthy flooring options currently on the market.

Figure 5:
Comparison between the initial specifications and final specifications



Transparency

The most informative product declarations were Declare labels and HPDs with a disclosure threshold of 100 ppm. Of the 277 total products we vetted (including alternatives), 53 had Declare labels, including 27% of all Type 1 products and 10% of Type 2 products.

Table 4: Declare Label frequency in Sol on Park's final specifications

	Type 1	**Type 2**	**Total**
Products with Declare Labels	40	13	53
Percentage of Products with Declare Labels	27%	10%	19%

We found that transparency varied significantly by manufacturer, and some product types were more difficult to research than others. For example, of all the paint manufacturers we vetted, only one provided full ingredient disclosure with Declare labels. Some manufacturers did not disclose ingredient information at all, citing competitive advantage. Others offered LBC compliance letters, which indicate an internal Red List Free designation but do not disclose ingredients or provide third-party verification. Ultimately, the easiest manufacturers to work with were those with the most transparent documentation and clearest communication. HPDs and Declare labels are great ways for manufacturers to report health information associated with their products and help design teams make informed decisions. Even if a manufacturer has not yet completed the HPD or Declare process, swift responses to chemical content inquiries are incredibly helpful and demonstrate a commitment to transparency.

Frequently Used Chemicals

Rather than just track whether or not a product contained a Red List or Priority List substance, this study documented the specific toxic chemicals encountered throughout the vetting process.

Red List chemicals appeared 79 times in the 277 products vetted for Sol on Park. The most common Red List chemical we encountered was formaldehyde resin, which accounted for 11% of all Red List appearances. Chemicals in the formaldehyde polymer

family - formaldehyde resin, formaldehyde melamine polymer, melamine urea, urea, urea polymer with formaldehyde, and formaldehyde - made up 27% of all Red List appearances.

Red List

Table 5:
Red List chemicals in Sol on Park's specifications

Red List Substance	Number of Instances	Percentage
9003-35-4 Formaldehyde Resin	9	11%
9002-86-2 Ethene, Chloro-, Homopolymer	6	8%
84852-15-3 Nonylphenol	6	8%
9002-86-2 Polyvinyl Chloride	6	8%
9084-06-4 Sodium Polynaphthalenesulfonate	5	7%
9003-08-1 1,3,5-Triazine-2,4,6-triamine	5	7%
9003-08-1 Formaldehyde melamine polymer	5	7%
37293-74-6 Naphthalenesulfonic Acid	4	5%
91672-41-2 Phenol	4	5%
25085-99-8 Epoxy Resin	4	5%
1675-54-3 Epoxy Polymer	3	4%
25036-13-9 Melamine Urea	2	3%
25036-13-9 Urea	2	3%
26140-60-3 Terphenyls	2	3%
85-68-7 Butyl Benzyl Phthalate	2	3%
9011-05-6 Urea, polymer with formaldehyde	2	3%
18540-29-9 Chromium, ion	1	1%
50-00-0 Formaldehyde	1	1%
25068-38-6 Bisphenol-A-(epichlorhydrin) Epoxy Resin	1	1%
28064-14-4 Bisphenol F-(epichlorhydrin)	1	1%
68609-97-2 Oxirane	1	1%
1195978-93-8 Benzene	1	1%
91-20-3 Naphthalene	1	1%
80-05-7 4,4'-Isopropylidenediphenol	1	1%
28553-12-0 Diisononyl Phthalate	1	1%
77098-07-8 Benzenedicarboxylic Acid	1	1%
13674-84-5 Tris(2-Chloropropyl) Phosphate	1	1%
7440-38-2 Arsenic	1	1%
TOTAL	**79**	

Formaldehyde is often used as a binder or preservative in composite wood products, adhesives, insulation, and coatings. Though it occurs naturally in small, harmless amounts, formaldehyde is a known carcinogen under conditions of high or prolonged exposure.[16] The synthetic formaldehyde used in large quantities in construction materials is also a potent ocular and respiratory irritant and has been linked to increased risk of asthma, allergic reactions, bronchitis, and lung inflammation, particularly in vulnerable populations like children and the elderly.[17] Adverse health effects of formaldehyde are more pronounced in spaces with poor ventilation,[18] and those with the highest risk are construction workers and manufacturers who work with resin and pressed wood products.[19]

In addition to the hazards of formaldehyde itself, the methanol used to produce it is typically manufactured from natural gas. This process emits significant amounts of greenhouse gases.[20]

Priority List chemicals appeared 116 times in Sol on Park's specifications, and the most common substance was petroleum. Petroleum-derived solvents and distillates, including heavy paraffinic distillate solvent, aromatic petroleum distillate, naphtha, hydrodesulfurized heavy naphtha, petroleum distillates, heavy aliphatic solvent, slack wax, hydrotreated heavy naphthenic distillate, and stoddard solvent, comprised 58% of all Priority List appearances.

[16] U.S. Department of Labor, "Formaldehyde - Hazard Recognition | Occupational Safety and Health Administration," n.d); The New School: Parsons, "Healthy Materials Lab | Composite Wood Products," n.d.; Carmela Protano et al., "The Carcinogenic Effects of Formaldehyde Occupational Exposure: A Systematic Review," Cancers 14, 2021

[17] National Center for Environmental Assessment, "Formaldehyde; CASRN 50-00-0," (Integrated Risk Information System Chemical Assessment Summary), United States Environmental Protection Agency, n.d.; Adriana Lino-dos-Santos-Franco et al., "Differential Effects of Formaldehyde Exposure on the Cell Influx and Vascular Permeability in a Rat Model of Allergic Lung Inflammation," Toxicology Letters, 2010); Gerald McGwin, Jeffrey Lienert, and John I. Kennedy, "Formaldehyde Exposure and Asthma in Children: A Systematic Review," Environmental Health Perspectives, 2010)

[18] U.S. Environmental Protection Agency, "What Should I Know about Formaldehyde and Indoor Air Quality?," 2019

[19] Center for Disease Control and Prevention (CDC), "CDC Archives: Formaldehyde," 2024

[20] Carlo Hamelinck and Mark Bunse, "Carbon Footprint of Methanol," Methanol Institute, 2022; The Athena Sustainable Materials Institute, "A Cradle-To-Gate Life Cycle Assessment of North American Wood Product Resin Systems," prepared For the U.S. Endowment for Forestry and Communities and USDA Forest Service Forest Products Laboratory, February 2022

Priority List

Table 6: Priority List chemicals in Sol on Park's specifications

Priority List Substances	Number of Instances	Percentage
64742-65-0 Heavy Paraffinic Distillate Solvent	30	26%
64742-95-6 Aromatic Petroleum Distillate	13	11%
64742-48-9 Naphtha (Petroleum)	9	8%
101-68-8 4,4'-Methylenediphenyl diisocynate	8	7%
10043-35-3 Boric Acid	5	4%
108-88-3 Toluene	5	4%
556-67-2 Octamethyl Cyclotetrasiloxane	5	4%
68131-74-8 Fly Ash	5	4%
9016-87-9 Polymethylene polyphenyl isocyanate	4	4%
9016-87-9 Isocyanic Acid	4	4%
60864-33-7 Polyethylene Glycol Benzyl	4	4%
64742-82-1 Hydrodesulfurized Heavy Naphtha	3	3%
13463-41-7 Zinc Pyrithione	3	3%
64742-56-9 Distillates (Petroleum)	3	3%
64742-82-1 Heavy Aliphatic Solvent	3	3%
64742-61-6 Slack Wax	2	2%
818-08-06 Dibutyltin Oxide	2	2%
22673-19-4 Tin	1	1%
75-37-6 1,1- Difluroethane	1	1%
78-40-0 Triethyl Phosphate	1	1%
63449-39-8 Chlorinated Paraffin	1	1%
97-99-4 Tetrahydrofurfuryl Alcohol	1	1%
7440-41-7 Beryllium	1	1%
64742-52-5 Hydrotreated Heavy Naphthenic Distillate	1	1%
8052-41-3 Stoddard Solvent	1	1%
TOTAL	**116**	

Petroleum-based chemicals are widely used in flooring, adhesives, sealants, coatings, and plastic components. While finished products are not always toxic to occupants, the extraction, refinement, and processing of petroleum can pose significant health risks to workers and nearby communities. Occupational exposure to petroleum, which is a fossil fuel, can adversely affect the lungs, central nervous system, and even increase the likelihood of cardiac arrest and stroke.[21] Residents living near oil refineries and processing

[21] Centers for Disease Control and Prevention, "Gases and Vapors Continue to Pose Hazards on Oil and Gas Well Sites during Gauging, Fluid Transfer, and Disposal (2018)

plants are at higher risk of numerous health conditions due to air, soil, and water contamination.[22] Some research links the prevalence of childhood lead poisoning to families with one or more adult working in oil extraction due to toxic chemicals lingering on clothes or in vehicles.[23]

Embodied Carbon Analysis

Removing Red List chemicals from construction projects does not only protect occupants and workers from harmful exposure; it contributes to industry-wide efforts to decarbonize. Many Red List substances, particularly those derived from fossil fuels, have high embodied carbon impacts throughout their life cycle. To understand how healthy material choice could reduce greenhouse gas emissions, we conducted an embodied carbon analysis comparing Sol on Park's initial specifications with Red List Free alternatives.

Methodology

We exported products directly from Sustainable Minds into EC3, an open-access accounting tool that can compare the carbon emissions produced during the manufacture and transportation (life cycle phases A1-A4) of different building materials. Because EC3, like all carbon accounting software, uses Environmental Product Declarations (EPDs) to estimate carbon impact, only products with EPDs could be included in the analysis. Of Sol on Park's initial specifications, just one third of product categories included one or more options with EPDs, highlighting the limited availability of data concerning the environmental impact of materials and life cycle assessments in the current market.

The "Initial Specs" used for the EC3 analysis represent a hypothetical specification where just one product with an EPD was chosen for each applicable category. The "Red List Free Specs" represent the substitution of each product in the Initial Spec with a Red List Free option. Due to the shortage of EPDs, the scope of this analysis is narrow, and the results cannot be generalized to the entire project. Still, among the included products there was

[22] Roxana Z. Witter et al., "Occupational Exposures in the Oil and Gas Extraction Industry: State of the Science and Research Recommendations," American Journal of Industrial Medicine 57, no. 7 (March 2014); Honghyok Kim et al., "Residential Exposure to Petroleum Refining and Stroke in the Southern United States," Environmental Research Letters 17, no. 9 (September 1, 2022)

[23] Fahad Khan, "Take Home Lead Exposure in Children of Oil Field Workers," The Journal of the Oklahoma State Medical Association 104, no. 6 (June 2011)

a correlation between the use of a Red List Free alternative and a reduction in carbon emissions.

Results

When Sol on Park's initially specified products with EPDs were substituted with Red List Free alternatives, the aggregate embodied carbon impact of the sample decreased by 32%. The most significant change came from the finishes, and the gypsum category in particular saw a large emissions reduction. This is because the initial specification included impact-resistant gypsum board, which has a substantial carbon impact during its manufacturing stage (ranging from 485-769 kgCO2) due to fossil fuel use and the release of mercury. When the impact-resistant board was replaced with regular gypsum board that produces fewer emissions (approximately 385 kgCO2), the embodied carbon impact of Sol on Park's finishes fell by approximately 60%. Impact-resistant gypsum board is not always necessary and there are no Red List free options, so regular gypsum can be a strong alternative in many cases. If impact-resistance is needed, corner guards can increase the durability of regular gypsum.

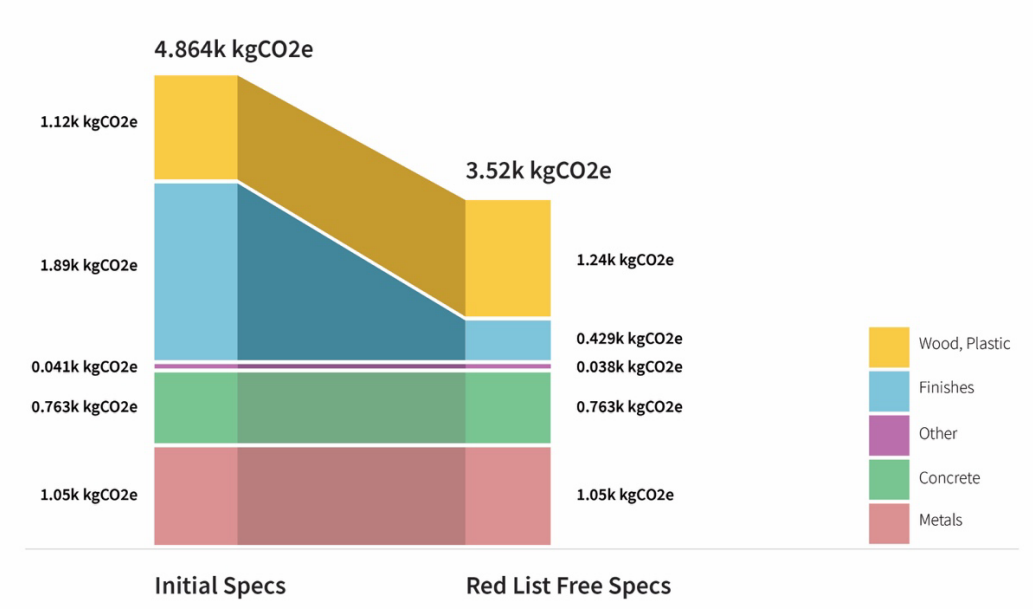


Figure 6: Embodied Carbon Comparison between Initial Specs and Red List Free Specs

Notably, the embodied carbon impact of wood and plastic increased with the substitution of healthier alternatives. This is because a locally produced medium-density fiberboard (a type of engineered wood) was replaced by a Red List Free option from the west coast. The increase in carbon emissions was the result of transporting the product to Sol on Park's site in New York, which underscores the importance of healthy product availability at the local level.

Resilient Flooring Case Study

To better understand the relationship between healthy material choice and embodied carbon, we compared the carbon impact of various resilient flooring options, a category not included in the EC3 analysis because neither of Sol on Park's initially specified options had EPDs. We reviewed both luxury vinyl tile (LVT) options, which contain Red List chemicals, and Red List Free alternatives like linoleum and polyurethane.

When reviewing resilient flooring with a width of 2.5mm, we found that LVT products had significantly higher embodied carbon impacts than Red List Free alternatives. The emissions[24] associated with Red List products ranged from 6.12 CO_2e to 11.40 CO_2e, while Red List Free products ranged from -4.4 CO_2e to 2.76 CO_2e. Negative embodied carbon values indicate that the product sequesters more carbon than it emits. Substances like polyvinyl chloride (PVC) and formaldehyde that are used to produce LVT flooring account for most of its high embodied carbon impact.

Even if a resilient flooring option has a relatively low embodied carbon impact, the adhesives involved in installation and application can have their own carbon footprint. For all products considered above, no Declare labels, HPDs, or EPDs for associated adhesives were included, which makes it challenging to determine which flooring strategy has the lowest impact. Some manufacturers have noted that there is little documentation due to the proprietary nature of the formulations used by their adhesive suppliers.

Detailed Product Comparison

Just because a product is Red List Free or Approved does not mean it is automatically the best choice within its class. Products can avoid the worst known toxins but still have negative impacts on human health, wellbeing, and the environment, so factors beyond Red List status should be considered for the most comprehensive comparison. Additionally, some types of materials have few feasible healthy products, so responsible material selection may involve efforts to eliminate that material altogether rather than choose between harmful options.

To better understand Sol on Park's specifications and critically evaluate our material options, we used the Informed Product Guidance tool developed by Habitable (formerly Healthy Building Network) to organize our research and weigh the benefits and drawbacks of different products. Habitable is an organization that advocates for

[24] CO_2e, or carbon dioxide equivalent, is used to measure greenhouse gas emissions based on how severely they contribute to global warming.

environmentally conscious and sustainable building design, and their Informed Product Guidance resource ranks materials from "best in class" to "worst in class" to encourage careful product selection. Habitable evaluates materials based on six criteria: content, extraction and manufacturing, installation, length of life, end of life, and "transformation targets".[25] Their color-coded categorization system allows for easy comparison of the health and environmental impacts of different materials at all life cycle stages.

When applying Habitable's ranking system to Sol on Park, we chose to focus on materials with the most Red List Free options. We analyzed resilient flooring, floor adhesives, insulation, paint, acoustic ceiling panels, and countertops. Most of these material categories are Type 1, with the exceptions of resilient flooring and countertops, which had more Red List Free options than expected. The selected categories represent large volumes of material in typical multifamily projects and substantial surface areas with which occupants make frequent contact. The purpose of this analysis was not to make definitive choices for the final building or determine feasibility, but to holistically compare the human and environmental health impacts of the product options in Sol on Park's final specifications.

Detailed tables that organize Sol on Park's specifications using Habitable's color-coded ranking system can be found in Appendices A, B, C, D, E, and F. If a product type was not included in Habitable's guidelines, it was represented in grey. The content of these tables is summarized below.

Resilient Flooring

Sol on Park's final specifications included several linoleum options, which are considered "best in class" by Habitable. Unlike many synthetic flooring types, linoleum is made from natural ingredients. It is also non-toxic and emits no respiratory irritants or allergens, which is especially beneficial in urban areas where indoor air quality is of high importance.[26] Polyurethane flooring is ranked lower than linoleum because of its high life cycle impact compared to other products. Polyurethane can also cause asthma and other respiratory problems.[27]

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[25] From Habitable's Transformation Targets Guide: "Transformation Targets are the top priority product and chemical combinations we recommend eliminating in the built environment. We identify and prioritize Transformation Targets based on the severity of the hazard, volume of hazardous chemicals, potential for exposure throughout the product life cycle, and clear pathways to avoid those hazards." For more information about Habitable's ranking system, see their "Informed Methodology" web page.

[26] Erica Chung, "Installing a New Floor? Here's How to Pick a Healthier Option - Center for Environmental Health," Center for Environmental Health, April 5, 2023

[27] The New School: Parsons, "Healthy Materials Lab | Flooring," n.d.

Vinyl is one of the worst ranked resilient flooring options due to its toxicity and carbon impact. Vinyl contains polyvinyl chloride (PVC), the production of which involves hazardous levels of mercury, asbestos, and other chemicals toxic to humans and the environment. Upon disposal, PVC is a significant pollutant.[28] It is also a primary component in LVT.

Habitable ranks recycled rubber floors as "worst in class" because recycled materials contain residuals, whose content can be difficult to determine. The recycled content in rubber floors often originates from tires, and the potential presence of harmful chemicals in the finished product is a concern.[29] Still, if strong screening practices can ensure that toxins remain below acceptable thresholds, recycled products could be sustainable options that eliminate waste and contribute to the circular economy.[30]

Floor Adhesives

Although many flooring options can be sustainable and healthy, the adhesives involved in their installation are difficult to source as Red List Free. Most adhesive formulas rely on hazardous chemicals to function correctly and few alternatives exist that are durable enough to support permanent installation.[31] Sol on Park's specifications included several peel-and-stick adhesives, which are considered better than others because they emit no chemicals when installed, unlike wet-applied options like acrylic adhesives that react on site during application. Habitable recommends avoiding adhesives altogether and opting for chemical-free installation methods such as nails or interlocking panels. For tile installation, adhesives can be substituted by mortars, which have more Red List Free options.

Insulation

Some insulations are Red List Approved but use binders that contain formaldehyde, so Red List Free options are preferable from a health perspective. Sol on Park's final specifications included several insulations made of blown-in fiberglass or mineral wool, which often do not need binders to function. Expanded polystyrene boards are ranked

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[28] Perkins&Will, "Healthy Environments: What's New (and What's Not) with PVC." The Healthy Building Network, November 2015; Center for Environmental Health, Autocase Economic Advisory, and Material Research L3C. "Flooring's Dirty Climate Secret: Quantifying Carbon Dioxide Emissions and Toxic Chemicals Used in Vinyl Flooring Manufacturing," Center for Environmental Health, 2022

[29] Jim Vallette, "Avoiding Contaminants in Tire-Derived Flooring," Healthy Building Network, April 2013.

[30] From The Circular Built Environment Playbook by World Green Building Council: "Unlike linear economic models - in which resources are disposed of at end of initial functional use - a circular economy optimizes the use of resources whilst minimizing waste throughout its whole lifecycle." See also "Healthy Materials Lab: Circularity" by The New School: Parsons.

[31] The New School Parsons, "Healthy Materials Lab: Adhesives, Mortars, Grouts, and Sealants," 2023

poorly because they contain flame retardants, which are toxic, bio-accumulative, and persistent in the environment.

Paint

Most of the paints specified for Sol on Park are acrylic paints, which vary significantly in formula and content. While acrylic paints can be Red List Free, they are still composed of plastic and contribute significantly to microplastic pollution.[32] Habitable ranks paints that contain polyfluoroalkyls (PFAs) much lower than other acrylics because of their potential for adverse health incomes. PFAs, sometimes called "forever chemicals," can accumulate in the human body over time and negatively impact fertility, immune function, hormone levels, and cancer risk.[33] Habitable does not address paint primers, but our research revealed many Red List and Priority List Free options. There are some mineral-based paints gaining traction such as those researched by the Parsons Healthy Materials Lab.[34]

Acoustic Ceiling Panels

Though all three acoustic panel specifications were Red List Free or Approved, the Red List Free options predictably ranked higher according to Habitable's guidelines. Acoustic panels often include binders made from formaldehyde, so products with formaldehyde-free binders are considered less toxic.

Countertops

Sol on Park's specifications included Red List Free countertop options, but none were particularly healthy according to Habitable's guidelines. Though quartz countertops are not toxic to building residents and are ranked higher than solid surface countertops, their fabrication and installation emit crystalline silica, which is a carcinogen. Occupational exposure to silica dust has been linked to severe respiratory symptoms, kidney failure, and lung disease.[35] Despite its health risks, silica is not included on the Red List, which emphasizes the importance of thorough research when making material choices. A Red List Free product is not automatically a harmless one.

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[32] Beyond Plastics. "Plastics in Building Materials and Products," n.d.

[33] United States Environmental Protection Agency, "Our Current Understanding of the Human Health and Environmental Risks of PFAS," November 2024

[34] The New School: Parsons, "Healthy Materials Lab | Discover Healthier Interior Paints," n.d.

[35] Occupational Safety and Health Administration, "Silica, Crystalline - Health Effects | Occupational Safety and Health Administration," (www.osha.gov, 2019); J.C Fazio et al., "Silicosis among Immigrant Engineered Stone (Quartz) Countertop Fabrication Workers in California," JAMA Internal Medicine 183, no. 9 (September 2023)

Conclusion

Through participation in Living Future's Safer Materials Shift cohort, MAP was able to specify a Red List Free or Approved option for 100% of Type 1 product categories and 25% of Type 2 categories for Sol on Park. This was a substantial improvement over the project's initial baseline specifications, in which 68% of Type 1 product categories and 20% of Type 2 categories had a Red List Free or Approved option. In the future, MAP plans to build off this research by studying the feasibility of Red List Free product alternatives and identifying low cost or cost-neutral substitutions.

The elimination of hazardous chemicals from construction has implications beyond the safety of buildings. Because many Red List products have higher embodied carbon impacts than their Red List Free or Approved alternatives, improvements to the materials economy will inevitably advance decarbonization efforts as well. The most common Red List and Priority List substances we encountered in Sol on Park's specifications, formaldehyde and petroleum, are derived from or use ingredients derived from fossil fuels, so ceasing or dramatically limiting their production is instrumental to our climate change mitigation goals.

Material safety is complex, and a thorough understanding of a building's health hazards and life cycle impact requires more than just checking the Red List. Habitable's Informed Product Guidance is a valuable resource for comparing products holistically and has helped MAP build a more comprehensive foundation around which to shape future material selection practices. However, despite its depth, this resource does not consider factors like cost, project scale, and distance between fabrication facility and final building destination. For example, cork is identified as one of the healthiest insulations due to its lack of chemical additives, but cork production is concentrated in Europe. The carbon emissions and costs associated with transportation to a project site in New York, especially at the scale required for a large multifamily building, would complicate its sustainability. Most buildings cannot choose the "best in class" for every material, so careful consideration and research on an individual project basis can help identify the best places to make improvements.

Over the course of this study, MAP became familiar with the contemporary landscape of tools and strategies that can help facilitate responsible and informed material choice. We found Sustainable Minds to be particularly useful for researching healthy materials and organizing our findings. The platform's free Transparency Catalog is an intuitive search engine for product documentation like Declare labels and HPDs, and for a reasonable fee subscribers can track products by individual project and build shared "libraries" for future

reference. For products with no transparency documentation, the Sustainable Minds team will reach out upon request to manufacturers not yet in the database. Ingredient and hazard disclosure varies substantially by manufacturer and product information is not always readily available, so tools like Sustainable Minds can ease the research burden and make healthy material choice more accessible.

The healthy materials market still has a long way to go. Many products have no Red List Free options at all, and some prominent manufacturers have released an eco-friendly line but have yet to standardize safe, sustainable products. Even when healthy options exist, lack of availability at the local level and the absence of widespread transparency documentation can be significant barriers to responsible material choice. Still, this study has demonstrated that significant improvements can be made despite current market limitations. Research at this scale is not necessary for every project – steps as simple as requesting transparency documentation or investigating the feasibility of several non-toxic products will help cultivate a market for safer materials. Industry-wide advocacy for better practices and standards, as well as efforts to enhance product options and availability, will result in healthier communities across the globe everywhere that building materials are extracted, manufactured, used, and deconstructed.

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Appendix

Appendix A - Resilient Flooring

Product Type	Manufacturer	Product Name	Red List Free/Approved	Red List/Priority List Chemicals	Transparency Documentation	Originally Specified
Linoleum	Forbo Flooring	Marmoleum Concrete	Yes		Declare, HPD, EPD	Yes
	Forbo Flooring	Marmoleum Cocoa	Yes		Declare, HPD, EPD	Yes
	Forbo Flooring	Marmoleum Modular	Yes		Declare, HPD, EPD	No
Ceramic Tile	Emser	Council	Yes		Declare, HPD, EPD	Yes
	Emser	Catch	Yes		Declare, HPD, EPD	Yes
	Ceramic Technics	Sienna Natural Wood	Yes		LBC Compliance Letter, SDS	Yes
	STP Tile	Nuances	Inconclusive		X	Yes
	STP Tile	Unique Travertine	Inconclusive		X	Yes
Carpet	Patcraft	Ecoworx Carpet Tile	Yes*		Declare	Yes
Polyurethane Resilient Flooring	TeknoFlor	Bio-Polyurethane Flooring	Yes*		Declare, HPD, EPD	Yes
	Windmoller GmbH	Polyurethane Floor Covering	Yes*		Declare, HPD, EPD	No
	Shaw	Innate Stria Tile	Yes*		Declare, HPD, EPD	No
Vinyl Floors	Tuffplank	Aberdeen	Inconclusive		X	Yes
	Kaindl	STRONGside Revive	Inconclusive		X	Yes
Recycled Rubber Floors	EcoSurfaces	Aurora RX	Inconclusive		HPD*, EPD	Yes
	Mondo	Dharma	Yes	101316-72-7 Lubricating Oils (Petroleum)	HPD, EPD	No
	Interface	Noraplan	Yes		HPD, EPD	No

Appendix B - Floor Adhesives

Product Type	Manufacturer	Product Name	Red List Free/Approved*	Red List/Priority List Chemicals	Transparency Documentation	Originally Specified
Peel and Stick Adhesive	Matter Surfaces	MI Mags	Inconclusive		X	No
	Matter Surfaces	MI Tabs	Inconclusive		X	No
Acrylic Adhesive	Custom Building Products	AcrylPro	Yes		HPD, Manufacturer Letter	No
	Laticrete	Laticrete Premium 15	No		Manufacturer Letter	Yes
	Mapei	Type I Mastic	No		Manufacturer Letter	Yes
Mortar	Laticrete	Laticrete 3701 Fortified Mortar	Yes	68131-74-8 Fly Ash	HPD,SDS	Yes
	Laticrete	Laticrete 254 Premium	No		HPD,SDS	Yes
	Laticrete	Laticrete MultiMax Lite	Yes		HPD, EPD	Yes
	Mapei	4 to 1 Mud Bed Mix	Yes		Manufacturer Letter, SDS	Yes
	Mapei	Keraflux Super	Yes		Manufacturer Letter	Yes
	Pro Spec	Floor Mud with B-710 SBR Acrylic Additive	Inconclusive		X	Yes
	Pro Spec	Permalastic Dryset Mortar	Yes		Manufacturer Letter	Yes
	Bostik	BAM	Inconclusive		X	Yes
	Sika	SikaLevel 050 Rapid Slope	Inconclusive		SDS	Yes
	Sika	SikaTile 350 Flex Set	Inconclusive		X	Yes
	Sika	SikaTile 475LHT Premium	Inconclusive		SDS	Yes

Appendix C - Insulation

Product Type	Manufacturer	Product Name	Red List Free/Approved*	Red List/Priority List Chemicals	Transparency Documentation	Originally Specified
Blown-In Fiberglass or Mineral Wool	Rockwool	Rockwool Cavityrock	Yes*	9003-35-4 Phenol	Declare, HPD, EPD	Yes
	Rockwool	AFB Evo	Yes		Declare, HPD, EPD	Yes
	Owens Corning	Thermafiber	Yes		Declare, EPD	Yes
	Johns Manville	Mineral Wool Board	No	9003-35-4 Phenol	EPD, SDS	Yes
Expanded Polystyrene Boards	Owens Corning	Foamular 250 NGX EPS	Yes*	75-37-6 1,1- Difluroethane 1195978-93-8 Benzene	HPD	Yes

Appendix D - Paint

Product Type	Manufacturer	Product Name	Red List Free/Approved*	Red List/Priority List Chemicals	Transparency Documentation	Originally Specified
Acrylic/Latex Paint Free of APES and PFAS	PPG	6-70ZV Speedhide Interior Flat White	Yes	64742-56-9 Distillates (Petroleum) 64742-65-0 Heavy Paraffinic Distillate Solvent 13463-41-7 Zinc Pyrithione	HPD*, Manufacturer Letter, SDS	Yes
	PPG	6-411ZV Speedhide Interior Eggshell White & Pastel Base	Yes	60864-33-7 Poly(Oxy-1,2-Ethanediyl) 64742-65-0 Distillates (Petroleum) 64742-54-7 Distillates (Petroleum)	HPD*, Manufacturer Letter, SDS	Yes
	PPG	6-500ZV Speedhide Interior Semi-Gloss White & Pastel Base	Yes	60864-33-7 Poly(Oxy-1,2-Ethanediyl) 64742-65-0 Distillates (Petroleum) 64742-54-7 Distillates (Petroleum)	HPD*, Manufacturer Letter, SDS	Yes
	Benjamin Moore	Benjamin Moore Ultra Spec Scuff-X Latex Eggshel	Inconclusive		SDS	Yes
	Benjamin Moore	Ultra Spec 500 Interior Eggshell T538	Yes	64742-65-0 Distillates (Petroleum)	Declare	No
	Benjamin Moore	Ultra Spec 500 Interior Satin/ Pearl Finish T545	Yes	64742-65-0 Distillates (Petroleum) 64742-54-7 Distillates (Petroleum)	Declare	No
	Benjamin Moore	UltraSpec 500 Low Sheen Eggshell T537	Yes	64742-65-0 Distillates (Petroleum)	Declare	No
	Benjamin Moore	UltraSpec 500 Interior Flat Finish T535	Yes	64742-65-0 Distillates (Petroleum)	Declare	No
	Benjamin Moore	Eco Spec Interior Eggshell (W374)	Yes	2634-33-5 1,2-Benzisothiazol-3(2H)-one	Declare	No
	Benjamin Moore	Eco Spec Interior Flat (W373)	Yes	2634-33-5 1,2-Benzisothiazol-3(2H)-one	Declare	No
	Benjamin Moore	Eco Spec Interior Satin/Pearl (Y375)	Yes	2634-33-5 1,2-Benzisothiazol-3(2H)-one	Declare	No
	Benjamin Moore	Eco Spec Interior Semi-Gloss (W376)	Yes	2634-33-5 1,2-Benzisothiazol-3(2H)-one	Declare	No
Acrylic/Latex Paint Containing APES and/or PFAS	Sherwin Williams	ProMar 200 Zero VOC Interior Latex Eg-Shel	Inconclusive		SDS	Yes
	Sherwin Williams	ProMar 200 Zero VOC Interior Latex Semi-Gloss	Inconclusive		SDS	Yes
Primer	Benjamin Moore	High-Hiding All Purpose Primer	Yes	97-99-4 Tetrahydrofurfuryl Alcohol	HPD	Yes
	Benjamin Moore	Ultra Spec 500 Interior Latex Primer N534	Yes	64742-65-0 Heavy Paraffinic Distillate Solvent	Declare, HPD	Yes
	Benjamin Moore	Eco Spec Interior Primer (W372)	Yes	2634-33-5 1,2-Benzisothiazol-3(2H)-one	Declare	No
	PPG	Speedhide Zero Interior Latex Primer 6-4900XI	Yes		Manufacturer Letter, SDS	Yes
	PPG	SEAL GRIP Interior/Exterior Universal Primer/Sealer	Yes		Manufacturer Letter, SDS	Yes
	PPG	Pure Performance Interior Latex Primer 9-900	Yes	64742-65-0 Heavy Paraffinic Distillate Solvent	Manufacturer Letter, SDS	Yes
	Sherwin Williams	Builders Solution	Inconclusive		SDS	Yes
	Sherwin Williams	ProMar 200 Zero VOC Interior Latex Primer	No	9002-86-2 Ethene, Chloro-, Homopolymer	SDS	Yes
	Sherwin Williams	Multipurpose Latex Primer/Sealer B51 Series	Inconclusive		SDS	Yes

Appendix E - Acoustic Ceiling Panels

Product Type	Manufacturer	Product Name	Red List Free/Approved*	Red List/Priority List Chemicals	Transparency Documentation	Originally Specified
Formaldehyde-Free Fiberglass Acoustical Panels	Armstrong Ceiling Systems	Lyra PB Panels	Yes	97-99-4 Tetrahydrofurfuryl Alcohol	Declare, HPD, EPD	Yes
Formaldehyde-Free Mineral Fiber Acoustical Panels	Armstrong Ceiling Systems	Ultima Lay-In and Tegular (Fireguard)	Yes	64742-48-9 Hydrogenated Naphtha	Declare, HPD, EPD	Yes
Formaldehyde Mineral Fiber Acoustical Panels	Rockfon	Arctic	Yes*	9003-35-4 Phenol 9011-05-6 Urea	Declare, HPD, EPD	No

Appendix F - Countertops

Product Type	Manufacturer	Product Name	Red List Free/Approved*	Red List/Priority List Chemicals	Transparency Documentation	Originally Specified
Quartz	Wilsonart	Quartz Surfaces	Yes	64742-82-1 Hydrodesulfurized Heavy Naphtha	Declare, HPD	Yes
	Caragreen	Lapitec Musa	No		HPD, EPD	Yes
Solid Surface	Caragreen	Durat	Yes		Declare, HPD	No