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Response to Comments

Revisions to Prohibit PFAS in Building Restoration Products

March 11th, 2025

Overview

Project Background

Per- and polyfluoroalkyl substances (PFAS) are a group of synthetic chemicals that share a defining characteristic of carbon-fluorine bonds. This unique chemical structure makes PFAS extremely stable, resistant to degradation, and effective at repelling oil and water. As a result, PFAS have been commercially valuable additives for several product types. However, the stability of these chemicals also makes them highly resistant to breaking down in the environment. As persistent, bio accumulative toxins (PBTs), PFAS have contaminated soils and water bodies across the globe and are associated with several adverse health outcomes such as impacts on thyroid function, increased risk of certain cancers, and decreased immune responses to vaccines.

Green Seal began prohibiting PFAS as a chemical class in 2020 with the release of our certification criteria for hand sanitizers. At that time, we committed to taking this leadership position on PFAS in all our standards and have been making this update systematically. In June 2022, we strengthened the PFAS prohibitions in our cleaning and personal care product standards to encompass all PFAS as a chemical class. Now, we are similarly strengthening the PFAS criteria in our standards for paints & coatings, cleaning & degreasing agents, adhesives, and floor-care products. This additional requirement will raise the bar for health protections provided by product certifications; provide product transparency for purchasers and consumers; incentivize phasing out PFAS throughout the supply chain; and increase the demand for safer alternative chemicals that provide the same functions as PFAS.

Standard Development and Stakeholder Feedback

Green Seal standards are developed in an open and transparent process with input from market and technical experts. We solicit this feedback at multiple points throughout the development process. For this revision, Green Seal solicited applicants in the fall of 2023 to serve as engaged stakeholders in a Stakeholder Advisory Group. Throughout the project, this group of balanced stakeholders and other market and technical experts provided feedback on Green Seal's proposed criteria. As a developer of voluntary consensus standards, Green Seal works to achieve substantial agreement[1] from its stakeholders before circulating draft criteria for public comment. Having achieved substantial agreement, we proceeded with inclusion of the following criteria in the public comment draft:

- Regulating the intentional use of PFAS as a chemical class in products
- Using a class-based, structural definition for PFAS
- Having additional requirements for PFAS in colorants added at point-of sale for paints

[1] Green Seal Standards Development Manual. https://greenseal.org/wp-content/uploads/Green_Seal_Standards_Development_Manual.pdf

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Public comment was held from November 20th, 2024 to December 20th, 2024 and drew responses from manufacturers, advocacy groups, industry associations, testing laboratories, and consumers. All organizations that provided feedback are listed in Section 1 below. In Section 2 are all formal comments received during the public comment period. Section 3 includes Green Seal's responses to all comments received through the public comment process.

To review the proposals and other revision documentation, visit Green Seal's website.[2]

[2] https://greenseal.org/green-seal-standards/standard-projects/

Section 1. Participating Stakeholder Organizations

The following stakeholders provided recommendations, shared technical expertise, and submitted statements of approval or substantive objections. Green Seal greatly appreciates the time and expertise volunteered by these stakeholders during this initiative.

3M
The American Coatings Association (ACA)
Asian Paints Limited
Behr Paints
Benjamin Moore
Building Maintenance Services (BMS)
California Polytechnic State University
CRS Facilities Services
Essential Industries
GSF USA Inc.
The Healthy Building Network (HBN)
The Household and Commercial Products Association (HCPA)
Hillyard
Mind The Store/Toxic Free Future
New Dawn Manufacturing Company
Next Gen Supply Group
PPG Industries
Project Clean
Spartan Chemical Company, Inc.

Section 2. Comments Received During Public Comment Period

During the November to December 2024 Comment Period, Green Seal received five written comments from the following groups:

- Anonymous Comment[3]
- American Coatings Association (ACA)
- Asian Paints Limited
- Behr
- Household and Commercial Products Association (HCPA)

Comment, Anonymous

I strongly support the prohibition of PFAS use in any products. We lived without PFAS and will continue to be able to if they are not used. I don't care to have a glossy paint throughout the house. I'd rather it be safer, especially knowing that PFAS can contaminate your body simply through dermal contact.

Comment, American Coatings Association

Dear Ms. McIlhoney,

The American Coatings Association (ACA) appreciates the opportunity to comment on Green Seal's proposed changes to standard GS-11 related to per- and polyfluoroalkyl substances (PFAS) in paints, coatings, stains and sealers. ACA is committed to advising Green Seal to help improve product standards. The Association's membership represents 90% of the paint and coatings industry, including downstream users of chemicals, as well as chemical manufacturers. Our membership includes companies that manufacture a variety of formulated products including paints, coatings, sealants and adhesives and their raw materials.

I. Introduction

Regarding proposed changes to GS-11, ACA cautions against establishing a standard that assumes PFAS are readily substitutable. Certain types of fluorinated chemistries are essential to developing high-performance coatings. Other types are used to formulate low-volatile organic compound (VOC) architectural coatings and other low-VOC products. Certain products have no viable "PFAS" substitute. Although, ACA generally will refer to these substances as "PFAS," please note that fluoropolymers and the short-chained fluorinated solvents used by industry are not the types of "PFAS" associated with contamination.

The proposed changes to GS-11 also do not accurately reflect the marketplace for PFAS in coatings, nor are they indicative of environmental or human health impact of coatings with fluorinated chemistries. In effect, the proposed changes will result in lowering the utility of the GS-11 standard for the coatings industry. Maine and Minnesota are not the market drivers for PFAS in products. It remains uncertain how these states will implement their laws, and how companies will adapt distribution strategies. Both states also have processes for currently unavoidable use designations that may allow for continued use of essential products with fluorinated chemistries. For example, ACA notes essential use in coatings used to protect critical infrastructure, water delivery systems, medical devices, low-VOC coatings, etc.

Due to these uncertainties, Vermont is currently developing their PFAS reporting requirements by aligning with the definition of PFAS in U.S. EPA's Toxic Substances Control Act (TSCA) Section 8(a)(7) PFAS

[3] Green Seal accepts comments from any and all interested parties, including anonymous members of the general public. We welcome and solicit feedback from a wide range of sources in our efforts to develop our standards in a collaborative, transparent process and abide by our company values of Integrity, Ownership, and Excellence.

reporting rule. In Vermont's view, the wide range of chemicals in commerce covered by this definition goes beyond the universe of toxic PFAS that is the focus of their policy. It also focuses their requirement on data that all manufacturers will have due to Federal-level compliance initiatives. ACA has provided comment about the importance of alignment with EPA in its comment submitted to Green Seal in December 2023. ACA will not repeat that information here. Nonetheless, we hope you will reconsider this matter.

ACA and its members respectfully submit the following information regarding the issues described above:

I. Substitutes are not readily available for paints, coatings, stains and sealers.
ACA cautions against a general assumption that fluorinated chemicals will be substituted in paints, coatings, stains and sealers. Alternatives analysis is product and chemical specific, factoring in a variety of performance and technical factors. Some non-governmental organizations (NGOs) are suggesting silicone-based polymers as a drop-in PFAS substitute, but these do not function in the same manner for most formulated products. As discussed below, both the OECD (Organization for Economic Co-operation and Development) and the DoE (Department of Energy) indicate that fluoropolymer-containing architectural coatings, used on external buildings and structures, lose critical functionality when substituted. More frequent application of a less-effective paint results in additional environmental considerations. Also, as described below, a short-chained fluorinated solvent is used to maintain low-VOC levels in paint.

II. Certain high-performance coatings incorporate fluoropolymer chemistries.
Fluorinated chemistries are sometimes necessary to meet high performance standards, often reducing raw materials and energy usage due to durability of the fluorinated product. Further, paint manufacturers may formulate products to meet standardized performance requirements, such as the American Architectural Manufacturers Association (AAMA) 2605-20 (2020) *Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix)* or *SSPC Paint 47, Highly Weatherable Fluoropolymer Topcoat, Performance-Based***.** Federal agency specifications and municipal codes may adopt these and other related performance standards as requirements for coatings. Another application includes intumescent coatings on industrial buildings used to delay or stop the spread of industrial fires.

ACA encourages Green Seal to consider the necessity of fluoropolymers to meet certain performance specifications. Fluoropolymer binders are essential for providing the kind of durability, safety, and sustainability that permit long lifespan protective coatings for critical infrastructure such as bridges, buildings, and other structures; and are specified to meet several architectural industry performance standards, such as AAMA 2605, SSPC Paint 47, etc. Less effective technologies will lead to greater waste and replacement costs as well as a higher risk of structural deterioration and aesthetics reduction.

III. OECD publication regarding PFAS in paints and coatings notes that replacements do not perform at the same level as coatings with fluoropolymers
In January 2022, the OECD published *Per- and Polyfluoroalkyl Substances and Alternatives in Coatings, Paints and Varnishes (CPVs) (Report on the Commercial Availability and Current Uses)*.[1] The report considers uses, function and efficacy of alternatives to PFAS as used in paints and coatings, while focusing on three types of products:

- Coatings for cables and wiring;
- Coatings used on solar panels; and
- Household and architectural paints, while mostly focusing on paints for bridges.

For most uses, OECD concludes that performance characteristics of coatings with fluoropolymers make them more desirable products than their non-performing alternatives.[2] Use of coatings with fluoropolymers is

limited by need where a buyer is willing to pay additional costs for high-performance characteristics. When considering bridge paint, the OECD concludes that,
[I]t would cost approximately 26 % more with the FP (fluoropolymer) based coating compared to polyurethane. However, after 30 years it was concluded that the total cost for the polyurethane coating would cost 16 % more than the FP-based coating, owing to the faster degradation of the non-PFAS coating and therefore a need for more frequent recoating, with associated labour and material costs.

Additional material and manufacturing costs associated with non-fluoropolymer alternates have an environmental impact from increased use of raw materials, energy consumption, waste production and disposal, etc. ACA recommends considering the overall environmental effects of removing a high-performance coating with fluoropolymers from the market.

IV. Fluoropolymers used in coatings do not have properties associated with PFAS contamination
Fluoropolymers are considered “polymers of low concern” (PLC) recognized by several regulators, since they are chemically stable, non-toxic, non-bioavailable, non-water soluble and non-mobile. Recently, the State of Washington, Department of Ecology (hereinafter, “Ecology”), when considering fluoropolymers as part of its review of PFAS under *its Safer Products for Washington* program, concluded:

> Fluoropolymers have been found to have thermal, chemical, photochemical, hydrolytic, oxidative, and biological stability (Henry et al., 2018; Korzeniowski & Buck, 2019a). They are almost insoluble in water and not subject to long-range transport. With very high molecular weight (greater than 100,000 Da), fluoropolymers cannot cross the cell membrane. They are neither bioavailable nor bioaccumulative. Clinical studies of their use in medical devices has[sic] demonstrated lack of chronic toxicity or carcinogenicity and no reproductive, developmental, or endocrine toxicity.[3]

The two studies Ecology relies on, from *Henry, et.al*. and *Korzeniowski*, evaluated criteria to conclude that fluoropolymers are not mobile, bioavailable or bioaccumulative. Further, they do not transform into long chain, non-polymeric chemistries associated with PFAS contamination. Fluoropolymers have fundamentally different chemistry from PFOA,PFOS and other PFAS chemicals associated with contamination. Because of these qualities, fluoropolymers have been classified as “polymers of low concern” by regulators.[4]

The DoE (Department of Energy) recently concluded that fluoropolymers are distinct from non-polymeric PFAS chemicals in its report, *Assessment of Fluoropolymer Production and Use with Analysis of Alternative Replacement Materials*(published January 2024).This DoE report explains that due to the relatively smaller molecular weight, non-polymeric PFAS are mobile in a variety of media, increasing particle dispersion. Significantly higher molecular weight of all forms of fluoropolymers, over non-polymeric PFAS, makes fluoropolymers stable and non-water soluble compared to non-polymeric forms. The report notes that current literature suggests that fluoropolymers are generally non-mobile and cannot permeate the cell membrane. Some reports disputing these conclusions note evidence related to polymers rather than fluoropolymers.

The DoE further explains that,

> The unique characteristics of fluoropolymers can enhance product durability, sustainability and safety. Products that are lighter and longer-lasting will generally have lower lifecycle costs, embodied energy, transportation-related emissions, and safety risks.

Benefits of fluoropolymer usage in building construction and infrastructure are covered in Section 2.4.3,page 2-11 of the report. Fluoropolymer coatings can reduce building cooling costs and improve energy efficiency by up to 22%. Fluoropolymer coatings reduce building maintenance by extending building life, even in harsh environments, while enhancing overall stability. Fluoropolymer coatings also are resistant to dirt adhesion enhancing their solar reflective and protective properties.

For the reasons noted above, Canada proposed to exclude fluoropolymers from its definition of PFAS for regulatory purposes, proposed in its *Updated Draft State of Per- and Polyfluoroalkyl Substances (PFAS) Report*[5].

ACA recommends removing fluoropolymer-based paints from the scope of covered products.

I. Low-VOC architectural coatings are possible due to a short-chained fluorinated solvent.
ACA recommends updating the standard to note that short-chained PFAS are a critical component of low-VOC coatings. Advancements in coatings technology have led to significant reductions in volatile organic compound (VOC) emissions from paints and coatings. These changes are facilitated by a short-chained fluorinated solvent not associated with contamination of waterways. California's South Coast Air Quality Management District (SCAQMD), which includes the Los Angeles area, has the most stringent air emissions regulations in the country, due to air quality issues in the district. As such, ACA analyzes the air quality data collected by the local air district since it is a great indicator of emissions trends globally. The data collected in this area demonstrates that, despite increasing sales, emissions from architectural coatings have decreased by more than 40% since 2008. This dramatic reduction in emissions illustrates the industry's commitment to reducing its environmental footprint and improving air quality.

I. Conclusion
ACA appreciates Green Seal's willingness to discuss its proposed standard revisions with ACA. ACA recommends that Green Seal modify its definition of PFAS to eliminate chemicals with one fluorinated carbon atom and fluoropolymers. Please feel free to contact us if we can provide any additional information.

We look forward to continuing our engagement with you.

Sincerely,
Riaz Zaman and Suzanne Chang

1 *Alternatives in Coatings, Paints and Varnishes (CPVs) (Report on the Commercial Availability and Current Uses)* (hereinafter, "OECD Report") is available online at: https://www.oecd.org/chemicalsafety/portal-perfluorinated-chemicals/per-and-polyfluoroalkyl-substances-alternatives-in-coatings-paints-varnishes.pdf
2 OECD Report at p. 65-66
3 Washington Department of Ecology, *Per-and Polyfluoroalkyl Substances Chemical Action Plan*, p. 97,Sept.2022revision of original publication from April 4, 2021, available online at:https://apps.ecology.wa.gov/puLblications/documents/2104048.pdf.
4 See Henry, B.J., Carlin, J.P., Hammerschmidt, J.A., Buck, R.C., Buxton, L.W., Fiedler, H., Seed, J. and Hernandez, O. 2018,*A critical review of the application of polymer of low concern and regulatory criteria to fluoropolymers*, Integr Environ Assess Manag, 14: 316-334,available online at: https://doi.org/10.1002/ieam.4035;*See also* Korzeniowski, S.H., Buck, R.C., Newkold, R.M., El kassmi, A., Laganis, E., Matsuoka, Y., Dinelli, B., Beauchet, S., Adamsky, F., Weilandt, K.,Soni, V.K., Kapoor, D., Gunasekar, P., Malvasi, M., Brinati, G. and Musio, S. 2022.*Acritical review of the application of polymer of low concern regulatory criteria to fluoropolymers II: Fluoroplastics and fluoroelastomers*. Integr Environ Assess Manag, available online at: https://doi.org/10.1002/ieam.4646
5 See the Executive Summary in the Canadian Gazette, July 2024: https://www.gazette.gc.ca/rp-pr/p1/2024/2024-07-13/html/notice-avis-eng.html#ne3.

Comment, Asian Paints

Dear Green Seal team,

I am writing this e-mail representing Asian Paints Limited (India).

We welcome the move taken by Green Seal to restrict the use of PFAS in paints and coatings. We are continuously striving to align to stricter environmental standards. However, we find that the proposed prohibition has some serious consequences and we would like to highlight those for your consideration.

1. The dust levels and weather conditions in India are highly detrimental for dirt deposition. We have not found any alternatives of fluorinated polymers that provides dirt pick up resistance as effective as PFAS chemical class.
2. Alternatives available in the market like silicones were explored but they result into a newer problem of streak marks on the paint
3. Finding an effective alternative ingredient will take time

In view of these, we request Green Seal to put this implementation on hold.

Greetings
Subrahmanya

Comment, Behr

Hello,

Thank you for including us in this. We agree with the proposed changes.

In addition, I feel it is relevant and worthwhile for the manufacturer to ensure that PFAS is definitely not included in the raw materials that they are using to formulate with. Maybe it is a self-reporting requirement but the product manufacturer should do their due diligence to confirm that none of the raw materials they use in their formulations contain PFAS, versus only requiring that the manufacturer doesn't intentionally add PFAS based raw materials.

Let me know if this is clear.

Thank you!
Greg

Comment, Household and Commercial Product Association

Subject: HCPA Comments on the Proposal to Prohibit PFAS in Paints and Coatings, Adhesives, Floor Care Products, and Cleaning and Degreasing Agents

The Household & Commercial Products Association[1] (HCPA) appreciates the opportunity to provide comments on the *Proposal for Chemical Class Prohibition: Per- and Polyfluoroalkyl Substances (PFAS) Prohibited in Paints & Coatings, Cleaning & Degreasing Agents, Adhesives, and Floor-Care Products*. We respectfully urge thoughtful consideration of the comments and concerns detailed below.

HCPA represents a diverse array of trusted household and commercial products, committed to upholding the highest safety standards while prioritizing the protection of human health and the environment. Formulators and manufacturers consistently innovate, adapting their products to align with advancements in science and technology, evolving regulations, consumer preferences, sustainability objectives, and other market-driven factors. Many companies and products have never intentionally used PFAS. In niche products where PFAS had been used, many companies have reformulated away from their use due to health and environmental concerns associated with this class of chemicals, as seen in cleaning and personal care products included in this proposal. To illustrate this point, a survey of the ingredients in the HCPA Consumer Product Ingredients Dictionary identified that **less than one percent** of all ingredients could meet the proposed definition of PFAS. Additionally, in the limited situations in which intentionally added PFAS are present in formulated

products, it is because that ingredient imparts an essential function, and suitable replacements do not currently exist.[2]

HCPA applauds Green Seal for its ambitious initiative to eliminate PFAS from Green Seal-certified products. Many of our members rely on Green Seal certification to differentiate their products in the marketplace, as it is a highly respected standard recognized by numerous environmentally preferable product (EPP) purchasers. However, we have some significant concerns that may hinder the application of this proposal to other product categories and future Green Seal standards.

HCPA Encourages the Development of a Process to Allow for Exemptions from the Definition of PFAS

HCPA encourages Green Seal to incorporate an exemption process whereby companies can provide data and documentation to Green Seal that demonstrates the safety of specific substances that may be encompassed within the broad definition of PFAS proposed by Green Seal, but meet Green Seal's robust safety criteria for the intended uses outlined in the application.

HCPA cautions that the definition of PFAS in the proposal as "*a class of fluorinated organic chemicals containing at least one fully fluorinated carbon atom"* is broad and encompasses many substances that are not typically classified as PFAS. For instance, this definition would include hydrofluoroolefins (HFOs), which can be either gases or volatile liquids, depending on the chemistry, which degrade into naturally occurring substances within days. Additionally, HFOs do not bioaccumulate in the environment, are not mobile in soil or water, and have already undergone extensive regulation, testing, and review to demonstrate their safety across their life cycle, offering significant environmental benefits compared to earlier chemistries.[3]

Given the broad scope of the definition, which classifies thousands of compounds as PFAS, providing a pathway for exemptions based on scientific evidence is essential. In practice, only a small subset of compounds would be commercially relevant, and an even smaller fraction has been identified as persistent, bioaccumulative, and toxic (PBT) or as posing significant concerns to human health or the environment. It is also important to recognize that the term "PFAS" does not inherently indicate whether a specific substance is harmful, only that it fits the proposed definition.

HCPA is concerned that adopting an overly broad PFAS definition without a clear process for submitting a request for an exemption could result in unintended and unnecessary consequences. These include limiting access to essential products and restricting other critical substances that do not present a risk to public health or the environment. Additionally, there is concern that alternative ingredients may lack the same level of performance or functionality. In many cases, formulators would shift to alternative chemistries or ingredients if they could meet the necessary functional requirements with equal or greater efficacy; however, this is not always currently feasible.

To avoid these challenges, HCPA urges Green Seal to establish a pathway for exemptions based on robust scientific evidence. Such an exemption process could allow Green Seal to effectively capture the compounds of concern included in the proposed broad definition while excluding substances like HFOs, which are not typically classified as PFAS and do not share the health and environmental concerns associated with PFAS chemicals. By clearly defining an exemption process for substances with demonstrated low-risk profiles rather than applying a blanket definition, resources can be better allocated to avoid disincentivizing products that address environmental and public health priorities but need to use a chemical that meets the broad PFAS definition to achieve adequate performance.

HCPA Concerns and Recommendations for PFAS Testing

Green Seal has a robust registration process, which includes a full chemical review, and on-site auditing program that captures the use of any substances that do not meet the Green Seal standard.

As written in the proposal, analytical testing methods can be useful tools in determining the presence of a compound in a product. Green Seal notes that with PFAS, there are challenges with current testing methodologies. HCPA agrees with this, though believes that discussion is warranted about those challenges to testing for PFAS.

As the proposal shares, there is only a limited number of specific compounds which meet the definition of PFAS that can currently be identified. Total Organic Fluorine (TOF), which is used to detect potential PFAS in various products, including consumer products, is a useful *screening* tool. However, this test, by itself, does not prove the presence of substances that meet the definition of PFAS. The test aims to find any fluorine bonded to a carbon atom, regardless of whether that carbon atom is fully fluorinated or not. Further, depending on the formulation matrix, there can be several interferences that will distort the results of this testing. For instance, a high surfactant level, or the use of multiple types of surfactants with different charges (such as nonionic and anionic surfactants being formulated in the same product) will cause interferences within the test.

HCPA does not disagree with the need to validate that products do not contain substances that do not meet the Green Seal standard. However, HCPA encourages Green Seal to develop a process in which when the use of TOF identifies a product with potential PFAS – whether intentionally added or through contamination – that this triggers further investigation with the company. Further, HCPA encourages the development and establishment of a threshold or Permissible Quality Measure (PQM) that allows for low levels of contamination without the need for further investigation.

Lastly, given that Green Seal plans to implement random spot-check sampling during ongoing monitoring to test and validate the compliance process, HCPA must ask: who will bear this cost? Will a company, that may have already conducted similar or more detailed analytical testing, also need to pay for this testing? Or will Green Seal be charging fees that ultimately cover this cost? Ensuring compliance with the Green Seal standard is critically important, but before Green Seal incorporates random spot-checks, HCPA believes it is prudent to learn from companies what analysis they are already conducting as to not duplicate what is already being done.

Conclusion
We appreciate the Green Seal's consideration of these comments and welcome the opportunity for further discussion. Please do not hesitate to contact us if you would like to explore these matters further.

Sincerely,
Lígia Duarte Iler

1 The Household & Commercial Products Association (HCPA) is the premier trade association representing companies that manufacture and sell $180 billion annually of trusted and familiar products used for cleaning, protecting, maintaining, and disinfecting homes and commercial environments. HCPA member companies employ 200,000 people in the U.S. whose work helps consumers and workers to create cleaner, healthier and more productive lives.
2 Search performed on December 17, 2024, yielded 11 of 1905 (0.6%) ingredients containing "fluoro." www.productingredients.com
3 HFOs have very low global warming potential (GWP) and are not ozone depleting substances (ODS). HFOs have been developed to replace hydrofluorocarbons (HFCs) (low to high GWP, no ODS) which replaced hydrochlorofluorocarbons (HCFCs) (high GWP, low ODS), which replaced chlorofluorocarbons (CFCs) (high GWP, high ODS).

Section 3 Green Seal's Responses to Written Comments

Topic Categories

- General Feedback
- Definition of PFAS
- PFAS Substitutions and/or Exemptions
- PFAS Testing
- Research Time for Alternatives
- Cost of Spot-Checking

General Feedback

An anonymous stakeholder and Behr agreed with Green Seal's proposed revision to prohibit PFAS as a chemical class in our building restoration product standards.

Green Seal Response: We appreciate this support of the revision.

Behr recommended that manufacturers ensure that PFAS is not used in the raw materials of certified products.

Green Seal Response: We appreciate this feedback and support of the intended outcomes of the revision. As part of our compliance review for formulated products, Green Seal reviews 100% of the chemicals in a product formula by working directly with raw material suppliers for disclosures via a confidentiality agreement. As a result, any products certified against these criteria will go beyond regulating only the raw materials with PFAS known to the manufacturer. Our review process does the supply chain due diligence for manufacturers by ensuring the product is formulated with raw materials that do not use PFAS as functional ingredients or as known contaminants of formula chemistry.

Outcome: No changes were made to the standard criteria.

Stakeholder feedback encouraged clarification of the criteria around colorants to confirm that it only covers the scope of intentionally added PFAS.

Green Seal Response: We appreciate this note for clarification and will update the standard criteria to reflect this language, which was the intent of the revision to restrict intentionally added PFAS at any level in colorants added at the point-of-sale.

Outcome: The final standard language has been updated to include the red text below. Italicized terms are defined in the standard.

2.2.2 Colorant Added at Point-of-Sale. The criteria below apply to colorants specified by the manufacturer to be added to the product.

2.2.2.1 VOCs. The *VOC* concentration of the product including the colorant added at the point-of-sale shall not exceed 50 grams of *VOC* per liter of product above the levels allowed for the product without colorant.

An average *VOC* level calculation for a colorant shall be applied unless a manufacturer can provide documentation of the *VOC* levels of the colorant(s) and assurance that only those colorant(s) tested shall be used with the product.

2.2.2.2 PFAS. Colorant added at the point-of-sale shall not contain any *ingredients* or *components* that are *Per- and Polyfluoroalkyl Substances (PFAS).*

Definition of PFAS

The HCPA and the ACA both caution that the definition of PFAS recommended by Green Seal is too broad and will include chemical groups such as hydrofluoroolefins (HFOs) and fluoropolymers that do not present the environmental or human health harms that have been documented in well-studied PFAS.

Green Seal Response: We appreciate this feedback on potential updates to our PFAS definition. The definition landscape for PFAS has evolved over the last 15 years;[4] however, the prevailing definition used in regulatory efforts, such those by 21 US states[5] and by other voluntary ecolabeling programs,[6,7] is a class-based structural definition using the basis of "at least one fully fluorinated carbon atom." Additionally, support exists in the scientific community to regulate PFAS as a chemical class,[8,9] which includes the sub-categories of hydrofluoroolefins and fluoropolymers. At this time, Green Seal is maintaining our position of aligning with this prevailing definition to restrict PFAS as a chemical class due to our intended outcomes of eliminating PFAS from the supply chain and preventing future environmental pollution, as well as the lack of consensus on the health and environmental safety of the sub-categories mentioned, and the relevance to the scope of what Green Seal covers. For example, all chemicals with a fully fluorinated carbon atom have an underlying concern of environmental persistence, which could lead to increasing environmental concentrations and expensive remediation efforts over time.[10] Of the thousands of chemicals that present this potential concern, an extremely small amount have undergone a chemical hazard assessment to fully understand the scope of health and environmental impacts. As a result, our alignment with the "at least one fully fluorinated carbon" definition is intended to ensure that these chemicals are not entering the environment, where they may have unknown impacts and persist on long time scales when their uses are not essential to the function of the product.

Regarding Hydrofluoroolefins: HFOs are a chemical compound used in the refrigerant industry that were developed specifically to replace ozone-depleting refrigerants that were being phased out under the Kigali Amendment of the Montreal Protocol.[11] At this time, Green Seal is not aware of any products in the building restoration market under the scope of these standards that uses HFOs in their formula or packaging that would be impacted by including HFOs under the definition of PFAS.

[4] Implications of PFAS definitions using fluorinated pharmaceuticals. https://doi.org/10.1016/j.isci.2022.104020
[5] Safer States: An Alliance for a Healthier World. https://www.saferstates.org/
[6] GreenScreen Standard for Cleaners & C N Degreasers in Manufacturing. https://www.greenscreenchemicals.org/images/ee_images/uploads/resources/CPA_GSC_Cleaners_Degreasers_Standard_v1-0.pdf
[7] Cradle to Cradle Certified® Product Standard Version 4.0. https://cdn.c2ccertified.org/resources/certification/standard/STD_C2C_Certified_V4.0_FINAL_031621.pdf
[8] Scientists' Statement on Defining PFAS. https://drive.google.com/file/d/1YLB2zvWG5Ez6VeMqqbw77LpVEj0JTj1H/view
[9] Scientific Basis for Managing PFAS as a Chemical Class. https://doi.org/10.1021/acs.estlett.0c00255
[10] The high persistence of PFAS is sufficient for their management as a chemical class. https://doi.org/10.1039/D0EM00355G
[11] Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer. https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVII-2-f&chapter=27&clang=_en

Regarding Fluoropolymers: We agree that fluoropolymers have documented uses in building restoration products, including floor coatings. However, while research exists showing some fluoropolymers are polymers of low concern, or PLC, there are conflicting reports that identify health effects – specifically lung issues – when fluoropolymers are inhaled as an aerosol.[12] Aerosol applications are allowed under some of the standards covered in this revision. Research also indicates that the production and destruction of fluoropolymers creates other PFAS and toxic chemicals.[13] For example, "the manufacturing, use, and disposal of PFAS polymers emits harmful fluorinated building blocks and PFAS greenhouse gases, with 80% of historical PFAS environmental contamination estimated to have originated from polymer production."[14] Additionally, based on reports done by the Department of Energy and the American Coatings Association, fluoropolymers are mainly used in industrial-level architectural coatings.[15] These coatings or use applications are not covered at this time by Green Seal and so are not impacted by including fluoropolymers in this revision.

Outcome: No changes were made to the standard criteria.

PFAS Substitutions and/or Exemptions

HCPA counsels Green Seal to consider a pathway for exemptions to this definition that are supported by independent evidence.

Green Seal Response: We appreciate this recommendation. As noted above, Green Seal has aligned with the prevailing regulatory and scientific consensus position on PFAS which is to use a class-based structural definition. We are open to future updates of this definition, including if certain compounds or sub-classes should no longer be included or regulated the same due to the scientific consensus evolving on the hazards of this chemical class. However, at this time, we have not seen evidence or consistent movement from the regulatory community to warrant an update to our definition that would result in exemptions to our definition of PFAS.

Outcome: No changes were made to the standard criteria.

ACA cautions that there are not many substitutions for fluorinated chemicals in specific markets such as high-performance coatings, and that if there are substitutions, they may not perform as well as the original PFAS chemicals used.

Green Seal Response: We appreciate this recommendation and acknowledge that there do still exist markets and applications where fluoropolymers are a preferred product ingredient, mostly in heavy industrial or high-performance coatings such as solar panels, electric batteries, and aerospace engineering.[16] A report by the Organization for Economic Co-operation and Development (OECD) in 2022 does identify that fluoropolymers are used often in paints, noting that they are "primarily used for architectural purposes, in bridges, buildings, and commercial steelwork." However, the report also outlines several non-fluorinated alternatives such as nano ceramic and epoxy powders for powder

[12] Fluoropolymer-Associated Illness. https://doi.org/10.3109/15563650.2014.946610
[13] Are Fluoropolymers Really of Low Concern for Human and Environmental Health and Separate from Other PFAS? https://pubs.acs.org/doi/10.1021/acs.est.0c03244
[14] Sources, Fate, and Transport of Perfluorocarboxylates. https://pubs.acs.org/doi/10.1021/es0512475
[15] Assessment of Fluoropolymer Production and Use With Analysis of Alternative Replacement Materials. https://www.osti.gov/servlets/purl/2370520
[16] Fluoropolymers as Unique and Irreplaceable Materials. https://pmc.ncbi.nlm.nih.gov/articles/PMC10675016/

coatings, and acrylic or nano aluminum oxide.[17] Also, most applications for high-performance coatings and industrial paints fall outside of the scope of this revision. For example, the GS-11 Standard for Paints, Coatings, Stains, and Sealers excludes industrial coatings.

Green Seal also acknowledges that replacing chemical elements within previously existing formulas is a difficult and time-consuming process. However, there are recent studies that identify useful substitutions for PFAS within the scope of our standards. For example, a 2024 study undertaken at the ACA noted that paints using acrylic instead of PFAS out-performed paint containing PFAS at dirt resistance, tint strength, and gloss development; they stated that "paint performance may therefore be preserved through creative polymer design".[18] Additionally, a recent report from Habitable (formerly the Healthy Building Network) noted that 50% of paints surveyed did not contain PFAS, indicating that there are multiple commercially available formulas for paint that do not use PFAS or need its qualities to function.[19]

Outcome: No changes were made to the standard criteria.

The ACA notes that short-chained fluorinated solvents are necessary to facilitate low-VOC coatings.

Green Seal Response: Green Seal is not aware of any cited evidence that supports short-chained fluorinated solvents are necessary for low-VOC coatings. Additionally, while there is no nationally established definition of low-VOC,[20] Green Seal's current criteria for the GS-11 Standard for Paints, Coatings, Stains and Sealers requires that products meet lower VOC content requirements than the National Volatile Organic Compound Emission Standards for Architectural Coatings.[21] An internal review of product formulations as well as products making claims on the market indicate that there are several commercially available options that meet these lower VOC requirements for their product category and do not contain PFAS.

Asian Paints indicates that alternatives for fluorinated polymers have not been proven to hold up to the weather conditions commonly found in India and that alternatives such as silicones did not improve the paint quality (i.e., introduced streaking).

Green Seal Response: We appreciate this recommendation and agree that alternatives for PFAS in multiple market spaces are still being developed as new information is identified. Green Seal also acknowledges that weather patterns (including dust storms) unique to India could negatively affect product performance. Regarding alternatives for fluorinated polymers, there have been some recent studies on the effectiveness of paints that do not contain PFAS. In 2024, the ACA published a report noting that paint produced with acrylic instead of PFAS actually had superior dirt pick-up resistance when compared to paint formulated with PFAS.[18] Additionally, a report from the OECD that focused on

[17] Per- and Polyfluoroalkyl Substances and Alternatives in Coatings, Paints, and Varnishes. https://www.oecd.org/en/publications/per-and-polyfluoroalkyl-substances-and-alternatives-in-coatings-paints-and-varnishes-cpvs-report-on-the-commercial-availability-and-current-uses_6745457d-en.html
[18] Improved Performance in a Waterborne All-Acrylic Latex Produced Without PFAS. https://www.paint.org/wp-content/uploads/2024/03/waterborne-woPFAS_MarApr2024.pdf
[19] PFAS in Paints Per- and Polyfluoroalkyl Substances in Paints. https://habitablefuture.org/wp-content/uploads/2024/03/97-pfas-in-paints.pdf
[20] Emissions from low-VOC and zero-VOC paints – Valuable alternatives to conventional formulations also for use in sensitive environments? https://doi.org/10.1016/j.buildenv.2014.12.001
[21] National Volatile Organic Compound Emission Standards for Architectural Coatings. https://www.govinfo.gov/content/pkg/FR-1998-09-11/pdf/98-22659.pdf

alternatives for PFAS in architectural paints and coatings identified several silica-based polymers that were being used commercially as wetting and leveling agents.[17]

Outcome: No changes were made to the standard criteria.

Testing and Verification Methods for PFAS Compounds

HCPA encourages Green Seal to use total organic fluorine testing as a screening tool only for intentionally added PFAS or those present through contamination that allows further investigation with the company. HCPA also suggests the use of a PFAS threshold that allows for low levels of contamination without the need for further investigation.

Green Seal Response: We appreciate this feedback. While the standard criteria language proposed here does not include any type of fluorine testing requirements to prove conformity to the standard, Green Seal does intend to use total organic fluorine testing as part of its certification department's own quality assurance procedures. While the design of this quality assurance process has not been finalized, it is envisioned as random spot-check testing on a small percentage sample of products that have earned certification. This process is intended to be used by us as a proactive management tool to help validate that our formula review-based conformity assessment approach is working as expected, both to prohibit intentionally added PFAS from product formulas and to ensure that levels of contamination are coming in at the consistently low levels we anticipate. Should the results of our spot-check testing indicate that either of these hypotheses are incorrect, then we reserve the option to make future revisions to the criteria requirements to ensure they are achieving the desired outcomes. We also expect the data we collect over time can be used to help broaden the scientific understanding of levels of PFAS contamination present in these product categories.

Outcome: No changes were made to the standard criteria; however, we will take this feedback into consideration as we continue to develop and implement our spot-check testing program for certified products.

Research Time for Alternatives

Asian Paints notes that it will take time to either identify or develop an alternative for PFAS in their supply chain.

Green Seal Response: We appreciate this comment. Per Green Seal's existing policy on compliance with Standard updates,[22] any products already certified under Green Seal standards will be allotted time to comply with the new criteria. The amount of time will be publicly communicated on the standard webpage.

Outcome: No changes were made to the standard criteria.

Cost of Spot-Checking

HCPA asks how Green Seal will spread the cost burden of the proposed random spot check sampling that will be conducted to test and validate the compliance process.

Green Seal Response: We appreciate this comment for clarification and can confirm that the cost for the random spot checking used to test and validate our compliance process will not be charged to

[22] Green Seal Frequently Asked Questions: What happens to currently certified products when the standard changes? https://greenseal.org/about/faq/

individual customers. We also intend to work with manufacturers who have existing data from compliant testing.

Outcome: No changes were made to the standard criteria; however, we will take this feedback into account as we develop the structure, design, and communication materials around our random spot check sampling program

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Final Note Acknowledging Participating Stakeholders

Green Seal appreciates our stakeholders' time, expertise, and commitment to constructive collaboration as we pursue a common goal: to encourage the production and use of safer, greener cleaning products in household and professional settings. The technical and market expertise and insight provided during the process have been critical to carrying out evidence-based decision-making. We pledge to remain vigilant regarding newly defined hazards or stronger evidence of health risks noted for any product eligible for Green Seal certification and to continuously raise the bar to reflect today's sustainable product leaders.