CRITERIA FOR CERTIFICATION

ENVIRONMENTAL INNOVATION, GS-20 Edition 2.0

Sub-Category: Cleaning Equipment – Mop Heads

APPLICANT INFORMATION:	
Company:	ABCO Products
Product Name:	Mop Heads made from NaturaYarn
Website:	https://www.abcoproducts.com/

Introduction. Green Seal's Environmental Innovation Standard (GS-20) provides a framework for the certification of environmental innovations. This certification demonstrates that an independent third party has verified the innovative aspect(s) of a product results in a significant reduction of human health and environmental impacts compared to products of the same functional class, achieving innovations not previously demonstrated within a product category. Certification neither constitutes the development of a product category standard or benchmark, nor does it require competitors within a product category to use the same innovation strategies in their approach to claiming innovation.

Certification of Environmental Innovation. If the applicant can demonstrate the product conforms to all criteria within this document, Green Seal will provide a Certification of Environmental Innovation.

Innovation Claim. The applicant states that through a proprietary equipment design utilizing garment industry scraps resulting in 100% post-industrial reclaimed textile, mop heads made from NaturaYarn are able to achieve a minimum of 20% reduction of two or more significant environmental or human health impacts associated with this product category. Through this innovation, mop heads made from NaturaYarn: eliminate the greenhouse gas impacts associated with extracting virgin materials for plastic textile production; eliminate the use of additional agrochemicals, water consumption, and disruption to habitats associated with growing and harvesting additional virgin cotton; and establish a circular supply chain by increasing the value of post-industrial waste apparel scraps during the manufacturing phase.

Disclaimer. This Certification is not intended to identify all possible negative impacts and cannot rule out any unknown negative consequences from the use of this product.

Public Comment. A public comment period was held from April 6 – May 7, 2020. A second public comment period was held from June 10 – June 25, 2021 for review of revised criteria for mopheads with added preservatives.

OVERVIEW

1.0 Eligibility

Mop heads made from NaturaYarn by the company ABCO Products is eligible to be certified under the Environmental Innovation Standard (GS-20, Edition 2.0) because the product:

1. Is a commercially available end use manufactured product
2. Exists within a market that has comparable options that achieve the same function, and
3. Has lifecycle phases for which there exists published health and environmental impact information from credible sources.

Product Function

When used as intended, this product provides commercial wet and dry floor care maintenance.

The product is intended for use in commercial spaces including (but not limited to) industrial, hospitality, educational, and food service settings.

Comparable Alternatives

Comparable alternatives are prevalent on the market and are defined as conventional mopping textiles. An initial market review conducted in January 2020 shows that products are typically manufactured using blends of virgin and recycled synthetic fibers and virgin, post-industrial, and post-consumer recycled cotton.

Legal Compliance

Manufacturer shall not be in violation of any applicable environmental regulations or laws nor any applicable regulations under the authority of the U.S. Federal Trade Commission, U.S. Food and Drug Administration, or the U.S. Environmental Protection Agency (or equivalent if based outside the United States).

2.0 Summary of Lifecycle Impacts of Wet/Dry Mops

This section documents the anticipated human health and environmental lifecycle impacts associated with the production, manufacture, use, and disposal of wet/dry mops, noting the most significant (i.e., greatest in negative effect) impacts. Synthetic fibers used for mop heads are commonly made of nylon or polyester, which are plastics; when relevant, impacts are identified for cotton components and synthetic components.

Summary of Lifecycle Impacts

Lifecycle Phase	**Primary Impacts Identified**
Resource Extraction	For cotton components, soil erosion and degradation, soil and water contamination; for synthetic components, climate impact/global warming potential
Manufacturing	For both cotton and synthetic components, soil and water quality degradation, energy use, air emissions.
Use	For synthetic components, release of microfibers during use and laundering.
Waste Management and Disposal	For synthetic components, materials do not decompose.

Resource Extraction Phase (Fiber production)

Cotton-based Fibers

Cotton serves as the basis for nearly 50 percent of the world's clothes, household goods, and commercial products, and accounts for 85 percent of all-natural fibers used in these materials.[1] According to the World Wildlife Fund, "cotton's most prominent environmental impacts result from the use of agrochemicals (especially pesticides), the consumption of water, and the

[1] World Wildlife Fund, *Cleaner, Greener: Impacts and Better Management Practices.* January 15, 2013; p1. https://www.worldwildlife.org/publications/cleaner-greener-cotton-impacts-and-better-management-practices

conversion of habitat to agricultural use. Conventional production practices for cotton involve the application of substantial fertilizers and pesticides. Pesticides threaten the quality of soil and water, as well as the health of biodiversity in and downstream from the fields. Heavy use of pesticides also raises concern for the health of farm workers and nearby populations." In addition, "runoff of pesticides, fertilizers, and minerals from cotton fields contaminates rivers, lakes, wetlands, and underground aquifers. These pollutants affect biodiversity directly by immediate toxicity or indirectly through long-term accumulation."[2]

Synthetic Fibers
Synthetic fibers are made from synthesized polymers and small molecules. Their raw materials include petroleum-based chemicals, which present significant resource extraction impacts, particularly related to greenhouse gas emissions. According to the World Wildlife Fund, polyester (a comparable synthetic material to nylon) requires 3-5 times more energy to produce than cotton textiles.[3]

With regard to greenhouse gas emissions, according to a 2019 study by the Center for International Environmental Law,[4] "the extraction and transport of fossil fuels for plastic production [(i.e., cradle-to-resin)] produces significant greenhouse gases [an estimated 1.89 metric tonnes of CO_2e are emitted per metric tonne of plastic resin produced]. Sources include direct emissions, like methane leakage and flaring, emissions from fuel combustion and energy consumption in the process of drilling for oil or gas, and emissions caused by land disturbance when forests and fields are cleared for wellpads and pipelines." In addition to greenhouse gas emissions, Muthu et al. estimates 62 litres of water consumed in the resource extraction phase per kg of fiber to create synthetic polyester.[5]

Manufacturing Phase (Yarn, Fabric, Textile Production, Shipping)

Cotton and Synthetic Material Manufacturing
During the manufacturing phase, common environmental impacts from textile production include soil and water quality degradation from toxic effluent emissions from wet treatment processes from the use of dyes, dye carriers, lubricants, detergents, and complexing agents. These impacts apply to both cotton and synthetic fibers. According to the Natural Resources Defense Council, "A single [textile production] mill can use 200 tons of water for each ton of fabric it dyes. And rivers run red--or chartreuse, or teal, depending on what color is in fashion that season--with untreated toxic dyes washing off from mills."[6]

According to van der Velden et. al.,[7] energy use for production of yarn, fabric, and the finished product (including shipping) is dependent on a wide range of variables dependent on the processes employed and the region of manufacturer. The variables include the type of fiber, the makeup, the dyestuff, the dyeing technique, and the machinery employed to produce the fiber.

Synthetic Material Manufacturing
Greenhouse gas emissions are a significant impact within the manufacturing phase for *polyethylene terephthalate* production (a form of polyester, which is comparable to nylon). According to the Center for

[2] World Wildlife Fund, *Cotton: Overview.* https://www.worldwildlife.org/industries/cotton
[3] World Wildlife Fund, *Cleaner, Greener Cotton: Impacts and Better Management Practices.* January 15, 2013; p1. https://www.worldwildlife.org/publications/cleaner-greener-cotton-impacts-and-better-management-practices
[4] Center for International Environmental Law, *Plastic & Climate: The Hidden Costs of a Plastic Planet.* May 2019; p2. https://www.ciel.org/wp-content/uploads/2019/05/Plastic-and-Climate-FINAL-2019.pdf
[5] Muthu, S., et al., 2012. Quantification of environmental impact and ecological sustainability for textile fibers. Ecological Indicators 13(1), 66–74.
https://www.researchgate.net/publication/234028337_Quantification_of_Environmental_impact_and_ecological_sustainability_of_textile_fibres
[6] NRDC (2011) "Green Fashion: Beautiful on the Inside." Smarter Living.
[7] van der Velden, Natascha M, Patel, Martin K, Vogtländer, Joost G., 2014. LCA benchmarking study on textiles made of cotton, polyester, nylon, acryl, or elastane. International Journal of Life Cycle Assessment 19:331–356. DOI 10.1007/s11367-013-0626-9. http://www.woodguide.org/files/2014/07/LCA-textiles.pdf

International Environmental Law,[8] "plastic refining is among the most greenhouse gas-intensive industries in the manufacturing sector—and the fastest growing. The manufacture of plastic is both energy intense and emissions intensive in its own right, producing significant emissions through the cracking of alkanes into olefins, the polymerization and plasticization of olefins into plastic resins, and other chemical refining processes."

According to Material Economics,[9] plastic materials require 5.1 metric tonnes of CO2 per metric tonne of plastic produced for 100% virgin content (inclusive of the 1.89 $MTCO_2e$ extraction impact noted above), and only 1.4 metric tonnes of CO_2 per metric tonne of plastic produced for 100% recycled content.

Use & Disposal

Synthetic Materials

During the use phase, synthetic materials within mop heads shed microplastics when laundered and while used, which do not decompose in the environment. According to the U.S. National Library of Medicine,[10] microplastics are formed when plastic breaks apart into tiny beads as a product is used over time. "Microplastics both absorb and give off chemicals and harmful pollutants. Plastic's ingredients or toxic chemicals absorbed by plastics may build up over time and stay in the environment."

Cotton and Synthetic Products

At the end of their useful life, mop heads are generally disposed of and enter a landfill. While many synthetic materials can be recycled, mop heads designed to clean and pick up dirt and debris would require significant processing to be a viable recyclable material. In this regard, mop heads are unlikely to be a viable product for recycling.[11]

CERTIFICATION REQUIREMENTS

3.0 Environmental Innovation Review

This section details the applicant's proposed innovation claims, including

- Innovation Summary: describes how the applicant claims that their product differs from comparable products on the market,
- An Impact Reduction Statement: describes how the applicant claims that their product's innovation results in reductions of significant lifecycle impacts identified in the Product Lifecycle Impact Review (Section 2.0 herein),
- Market Analysis: describes the parameters for the applicant to demonstrate their claim that the product is the first and only product of its type to achieve this innovation during the Certification Phase, and
- Drawbacks Analysis: a summary of any potential drawbacks that Green Seal has identified and mitigations necessary.

The applicant stated that mop heads made from NaturaYarn achieve the Environmental Innovation *Option 1: Improved Design. i.e.,* the applicant states that the product can demonstrate a minimum of 30% reduction of one significant health or environment impact or a 20% reduction of two or more significant environmental or human health impacts, as identified in Section 2.0.

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[8] Center for International Environmental Law, *Plastic & Climate: The Hidden Costs of a Plastic Planet.* May 2019; p2. https://www.ciel.org/wp-content/uploads/2019/05/Plastic-and-Climate-FINAL-2019.pdf

[9] Material Economics. *The Circular Economy - a Powerful Force for Climate Mitigation,* Exhibit 3.4. https://materialeconomics.com/publications/the-circular-economy-a-powerful-force-for-climate-mitigation-1

[10] https://toxtown.nlm.nih.gov/sources-of-exposure/microplastics

[11] For example, the U.S. Environmental Protection Agency estimates that the 3.17 Mt of plastic waste recycled in the US in 2014 resulted in 3.2 million metric tonnes of CO_2e savings, which is equivalent to 670,000 less cars on the road over the course of a year. See US EPA, Advancing Sustainable Materials Management: 2014 Fact Sheet (2016), https:// www.epa.gov/sites/production/files/2016-11/ documents/2014_smmfactsheet_508.pdf

3.1 *Innovation Summary – How does this product differ from others on the market?*
The applicant states that through a proprietary equipment design resulting in mop heads made from 100% post-industrial blended cotton and polyester waste sourced from reclaimed textiles from garment manufacturing scrap, mop heads made from NaturaYarn are able to achieve a minimum of 20% reduction of two or more significant environmental or human health impacts associated with this product category.

The product design and manufacturing process leverages the textile waste material of a garment design center and promotes circularity within the apparel sector – one of the most well-documented and environmentally impactful manufacturing sectors. Textile waste is at an all-time global high; massive amounts of water and energy are used, and pollutants released into the environment, to generate textile material that would otherwise never reach an end user.

A market study[12] conducted at the Massachusetts Institute of Technology (MIT) estimates that, in 2015, the global apparel industry was poised to produce 400 billion square meters of fabric (including cotton, polyester, and blended textiles), up to 30 percent of which would become manufacturing waste through the cutting process to create the shapes of manufactured garments. Identifying manufacturers who might source post-industrial (pre-consumer) textile material has therefore become a priority for the apparel sector (and textiles more generally) in order to reduce impacts associated with the sector and create value from what has previously been considered exclusively waste material.

Through ABCO's proprietary process, scrap garment material is transformed into sliver, the precursor to mop fibers. The waste garment material is chopped and processed through a series of mechanical devices to be broken down and spun, then twisted into multi-ply material to be manufactured into mop heads. ABCO's textile scrap is either re-introduced into their fiber production or sent through the supply chain to other production facilities that integrate the scrap in the manufacture of other products. In 2018, ABCO manufactured a variety of products from NaturaYarn using over 9 million pounds of post-industrial reclaimed textile.

In addition, ABCO has installed on-site solar arrays at its production facility in order to reduce energy demand from non-renewable sources during the manufacture of its mop heads; ABCO continues to increase the share of its energy demand from on-site, renewable sources.

During the Certification Phase, Green Seal will verify these claims through a technical review.

3.2 *Impact Reduction Summary – How does the innovation result in impact reduction?*
Through the Lifecycle Impact Review (Section 2.0), the resource extraction and manufacturing phases lifecycle phases were identified as those with the most significant impacts. Additionally, when products include synthetic materials (i.e., polyester), the resource extraction, manufacturing and use phases have been identified as those with the most significant impacts.

Through reprocessing garment scrap through ABCO's proprietary process, the production of mop heads made from NaturaYarns allows industrial waste material to be repurposed into a durable end-use product. Through this innovation, mop heads made from NaturaYarn:

- eliminates the greenhouse gas impacts associated with extracting virgin materials for synthetic textile production;
- eliminates the use of additional agrochemicals, water consumption, and disruption to habitats associated with growing and harvesting additional virgin cotton; and
- establishes a circular supply chain by increasing the value of post-industrial waste apparel scraps during the manufacturing phase.

[12] Randolph Kirchain, Elsa Olivetti, T Reed Miller and Suzanne Greene. *Sustainable Apparel Materials.* Material Systems Laboratory at the Massachusetts Institute of Technology. September 22, 2015, p3 http://globalcompostproject.org/wp-content/uploads/2015/10/SustainableApparelMaterials.pdf

In addition, on-site solar array installation has to date resulted in the reduction of off-site generated energy demand by an estimated 10% (250 Kw). In April 2020, a 975 Kw solar installation will further reduce non-renewable energy demand to 32 percent.

During the Certification Phase, Green Seal will verify these claims through a technical review.

3.3 *Market Analysis – How unique is this innovation?*
A market scan conducted in January 2020 shows that no other product in this category on the North American market claims to be made solely from 100% post-industrial reclaimed textiles comprised of scraps sourced from the garment manufacturing industry, while further reducing the manufacturing impact through the installation of on-site solar arrays.

The public engagement period did not produce feedback indicating that other products of the same function currently make all of the above claims.

3.4 *Drawbacks Analysis – Has burden shifting occurred?*
As a result of a drawbacks analysis, Green Seal has not noted any burden shifting resulting from this product innovation. No mitigation is necessary.

4.0 Evaluation of Functional Performance and Fitness for Purpose
This section details the requirements to demonstrate that the applicant product functionally performs at least as well as or better than at least one nationally recognized or market leading product of its type, to be approved by Green Seal, including test methods and test reports to submit during the Certification Phase.

Test Methods
Applicant shall meet the requirements in this section to demonstrate the product functionally performs at least as well as or better than at least one nationally recognized or market leading product of its type, to be approved by Green Seal. The applicant shall use objective, scientifically validated testing methods conducted under controlled and reproducible laboratory conditions to demonstrate functional performance along the following parameters:

- Absorption
- Retention
- Strand Strength

Purpose and Scope of Test.

Absorption and Retention Test: To determine the ability of the mop head to soak up liquids and hold the liquid in the mop head until it is intentionally released by compression or twisting. Representative mops heads are taken from each production for testing in accordance with protocols described below and compared to both internal performance requirements as well as test results from at least two similar competitor's products purchased from standard consumer sources for new mops.

Strand Strength Test: To determine the ability of the strands used to produce mop heads to withstand physical stress. Representative samples of mop strands are taken from production runs and tested for strength. The results are compared to internal performance requirements as test results from at least two similar competitor's products purchased from standard consumer sources for new mops.

Personnel.
Each test requires one technical personnel. Note, ABCO has a QC department comprised of a QC manager and an auditor's team. This team is responsible for all scheduled and random testing conducted on representative samples for each production runs.

Facilities.
All tests and QC are conducted at the ABCO on-site laboratory. All test are conducted under ambient temperatures and humidity conditions.

Equipment.
The following equipment is necessary to conduct each test:

Absorption and Retention Tests:

- Mop Bucket with Wringer (capable of compressing the mop)
- Beaker
- Chronometer
- Portable digital scale capable of weighing maximum of 20 pounds
- Camera
- Hygrometer

Strand Strength Test

- Strand Strength Test Device
- Calibrated Digital Force Gauge Push and Pull Tester Dynamometer (e.g., Nextex DFS 1000)
- Hygrometer

Test, Control, and Reference Substrates.
The applicant shall follow the processes outlined below to test 1) Absorption and Retention, and 2) Strand Strength.

Absorption Test:

1. Assemble bucket, scale, water, beaker, chronometer, and camera to prepare for testing.
2. Use the Hygrometer to document temperature and relative humidity.
3. Prepare a sample wick for testing.
4. Weigh the wick.
5. Immerse the wick sample in water for 30 seconds.
6. Drain with slight tightening and submerge again for 1 minute.
7. Fold the mop and hang from sewed mop tab (i.e., drip by gravity) for one minute.
8. Weigh the sample.
9. To calculate absorption, apply the formula:

Final weight – [Initial weight / Initial weight] = [Oz water / Oz fiber].

Retention Test:

1. Assemble bucket, mop bucket with wringer, water, beaker, and camera to prepare for testing.
2. Use the Hygrometer to document temperature and relative humidity
3. Place 5000mL of water into the bucket.
4. Immerse the wick in the water for an estimated time of 1 minute and 30 seconds, ensuring that the wick is completely wet.
5. Remove the wick from the bucket, let the wick drain for 5 seconds.
6. Place the wick in the bucket with drainer/wringer and squeeze 3 times.
7. Measure the water in the mop bucket.
8. To calculate retention, apply the formula:

Total Impregnation / Retention = % Retention
Total Impregnation = Starting Amount of Water (i.e., 5000mL) – Water Not Absorbed After Immersion
Retention = Total Impregnation – Water Squeezed into Bucket

Strand Strength Test:

1. Select random samples from the Twister Machine according to the number of spindles that are in operation.
2. Carry out the tests on the Digital Force Meter Dynamometer (NEXTECH), placing a 22” wick into the machine.
3. Proceed with crank turns to measure the poundage at which the strand fails.

4. Document the results and repeat the test for remaining sample strands.

Test Results.
Test results shall be documented and demonstrated for the applicant product and at least one nationally recognized, market leading product of its type.

Records and Reports
During Certification, applicant shall submit all test reports and results to Green Seal.

Quality Assurance and Quality Control.
During Certification, applicant shall provide documentation of their quality assurance and quality control procedures to Green Seal.

5.0 Environmental and Human Health Requirements

This section describes the Environmental and Human Health requirements with which the applicant product must demonstrate compliance. Green Seal uses the following factors to determine requirements for this section:

- **Product Form**: the applicant product is a solid product.
- **Potential for Direct Human Exposure**: through regular handling and use of the product, the potential for inhalation, ingestion, or absorption is not present.[13]
- **Potential for Environmental Releases:** as described in herein, when the product is used as intended, the product does not create environmental releases to air, water, or land.[14]

See Annex A for relevant definitions regarding hazard categories and Annex B for Environmental and Human Health Requirements that do not apply to this product.

5.1 Disclosure
Applicant shall disclose all product parts through a Bill of Materials, including the part name, type (e.g., raw material, assembly, sub-assembly, component), part function, and material type (e.g., steel, aluminum, resin, nylon, etc.).

The product shall meet all requirements as described below, based on the conclusion of no exposure risks to human health (i.e., inhalation, ingestion, or absorption), or for environmental releases to air, water, or land.

5.2 Carcinogens, Mutagens, and Reproductive Toxins
From the point of material recovery, the product shall not contain any intentionally added components that are carcinogens, mutagens, or reproductive toxins.

5.3 Prohibited Components
From the point of material recovery, the product shall not contain any of the following intentionally added components.

- 1,2-dichlorobenzene
- 2-butoxyethanol
- Alkylphenol ethoxylates
- Formaldehyde donors
- The heavy metals lead, mercury, cadmium, hexavalent chromium, and antimony in the elemental form or compounds
- o-Phenylphenol
- Neonicotinoid pesticides

[13] Preservatives added to mop heads may have potential inhalation and absorption exposures. See Annex C for criteria that apply to mop heads with added preservatives.
[14] Preservatives added to mop heads may have these potential exposures. Seen Annex C for criteria that apply to mop heads with added preservatives.

- Nitro-musks
- Phthalates
- Polycyclic musks
- Triclosan
- Triphenyl tins and tributyl tins

5.15 Colorants.
From the point of material recovery, each colorant used in production shall meet one of the following:

- Be U.S. Food and Drug Administration-certified and permitted for ingestion.
- Be a natural colorant.
- Not have any of the following heavy metals intentionally added: arsenic, cadmium, cobalt, hexavalent chromium, lead, manganese, mercury, nickel, and selenium.

5.20 Bleaching.
From the point of material recovery, fiber-based materials used in the product shall not be bleached with chlorine during the manufacturing process.

6.0 Packaging Requirements

Applicant shall meet the following packaging requirements as applicable.

Primary and Secondary Packaging.
Primary and secondary packaging shall meet the following requirements, based on the packaging material type:

Packaging made from paper or paperboard shall be *recyclable* and made from 100% recovered material.

Packaging made from containerboard (corrugated cardboard) shall be *recyclable* and made from at least 30% recovered material.

Packaging made from plastic shall be *recyclable*, or source-reduced by 20%, or shall contain 25% recovered material content (pre- or *post-consumer material*).

Heavy Metal Restrictions
The heavy metals lead, mercury, cadmium, and hexavalent chromium shall not be *intentionally introduced.* Further, the sum of the concentration levels of these metals shall not exceed 100 ppm; an exception is allowed for *refillable packages* or packages that would not exceed this maximum level but for the addition of *post-consumer material*.

Other Restrictions
Phthalates, bisphenol A, and chlorinated packaging material are prohibited from being intentionally introduced to plastic packaging; an exception is allowed for packages that would not have added phthalates, bisphenol A, or chlorinated packaging material but for the addition of post-consumer material.

7.0 Product Labeling Requirements

Not applicable for this product category. See the GS-20 Environmental Innovation Standard for reference.

8.0 Trademark Use Guidelines

Trademark Use.
Any use of the Green Seal® Certification Mark or Green Seal name, e.g., on the product, product label, packaging, secondary documents, or promotional materials, must be in accordance with Green Seal's Trademark Use Guidelines.

Misleading Claims.
The Green Seal Certification Mark shall not be used in conjunction with any modifying terms, phrases, or graphic images that might mislead the consumers as to the extent or nature of the certification.

ANNEX A (Glossary of Terms)

Note that the defined terms are italicized throughout the Environmental Innovation Standard, GS-20.

Asthmagen. A substance designated as an asthma causing agent by the Association of Occupational and Environmental Clinics (AOEC), which after review by AOEC have met the AOEC sensitization criteria.

Burden Shifting. A concept within product lifecycle review frameworks that defines an unintentional consequence of a change in the system that results in a reduction in one impact category and a significant increase in another impact category, e, g., carbon emissions.

Carcinogen. A chemical listed as a known, probable, reasonably anticipated, or possible human carcinogen by the International Agency for Research on Cancer (Groups 1, 2A, and 2B), National Toxicology Agency (Groups 1 and 2), EPA Integrated Risk Information System (weight-of-evidence classifications A, B1, B2, C, carcinogenic, likely to be carcinogenic, and suggestive evidence of carcinogenicity or carcinogen potential), or by Occupational Safety and Health Administration (as carcinogens under 29 Code of Federal Regulations (CFR) 1910.1003(a)(1)).

Colorant. A product *component*, such as a dye or pigment, whose only function is to change the product's color.

Component. A constituent that is deliberately added at any level for its continued presence in the final product to provide a specific characteristic, appearance, or quality[15] or a contaminant that was not deliberately added but is present above 0.01% by weight in the product.

Exposure Pathway. The way in which a person can be exposed to a hazardous substance. A complete exposure pathway includes (1) the source of chemical and mechanism for release, (2) the exposure point, (3) the transport medium (i.e., from source to exposure point, if different), and (4) the exposure route (e.g., ingestion, inhalation, absorption, etc.).

Fragrance. An additive, often (but not limited to) a multi-*component* additive, used in a product with the purpose of imparting a scent to the product.

Independent Laboratory. A laboratory that (1) has been recognized by a laboratory accrediting organization to test and evaluate products to a related product standard, and (2) is free from commercial, financial, and other pressures that may influence the testing and evaluation process.

Intentionally Introduced. The use of substances for their desired or deliberate presence in the *primary package* for the purpose of providing a specific characteristic or quality. It does not refer to the use of substances as processing aids or the use of an intermediate that imparts certain chemical or physical changes during manufacturing, as long as the substance or intermediate is present in the *primary package* at concentrations below 100 ppm.

Mutagen. A chemical that meets the criteria for Category 1, chemicals known to induce heritable mutations or to be regarded as if they induce heritable mutations in the germ cells of humans, under the GHS.

Natural Colorant. A *colorant* that comes from biological products, forestry or agricultural materials (including plant, animal, and marine materials), or minerals.

Post-Consumer Material. Material that would otherwise be destined for solid waste disposal, having completed its intended end-use and product life cycle. Post-consumer material does not include materials and by-products generated from, and commonly reused within, an original manufacturing and fabrication process.

Primary Package. Package material that physically contains and contacts the product, not including the cap or lid.

[15] Naturally occurring elements and chlorinated organics that may be present as a result of chlorination of the water supply are not considered intentional components if the concentrations are below the applicable maximum contaminant levels in the National Primary Drinking Water Standards found in 40 CFR Part 141.

Product As Used. The most concentrated form of the product that the manufacturer recommends for a product's intended use.

Recyclable. The package can be collected in a substantial majority of communities, separated or recovered from the solid waste stream and used again, or reused in the manufacture or assembly of another package or product through an established recycling program.

Refillable Package. A container that is routinely returned to and refilled by the product manufacturer at least five times with the original product held by the package, and demonstrated in practice. For the purpose of this standard, the product manufacturer or the product manufacturer's agent may refill a package.

Reproductive Toxin. A chemical listed as a reproductive toxin (including developmental, female, and male toxins) by the State of California under the Safe Drinking Water and Toxic Enforcement Act of 1986 (California Code of Regulations, Title 22, Division 2, Subdivision 1, Chapter 3, Sections 1200, et. Seq., also known as Proposition 65).

Respiratory Sensitizer. A substance designated as leading to hypersensitivity of the airways following inhalation of the substance and meeting the classification criteria of Category 1 respiratory sensitization (H334) in accordance with the GHS.

Secondary Packaging. Packaging used to contain *primary package*/s and typically used for merchandizing. This does not include case or shipping packaging or the *primary package*.

Serious Eye Damage. The production of tissue damage in the eye, or serious physical decay of vision, following application of a test substance to the anterior surface of the eye, which is not fully reversible within 21 days of application. Substances identified under Category 1 for Serious Eye Damage/Eye Irritation (H318) under the GHS are also considered to cause serious eye damage.

Skin Corrosion. The production of irreversible damage to the skin, namely visible necrosis through the epidermis and into the dermis, following the application of a test substance for up to 4 hours. Corrosive reactions are typified by ulcers, bleeding, bloody scabs, and, by the end of observation at 14 days, by discoloration due to blanching of the skin, complete areas of alopecia, and scars. Substances designated as Category 1A, 1B or 1C for Skin Corrosion/Irritation (H314) under the GHS are also considered to cause skin corrosion.

Skin Sensitizer. A substance that will lead to an allergic response following skin contact.

Undiluted Product. The most concentrated form of the product produced by the manufacturer for transport outside its facility.

ANNEX B (Environmental and Human Health Requirements that Do Not Apply to Mop Heads Without Preservatives)

5.4 Volatile Organic Compounds
No inhalation exposure pathway present; this requirement does not apply.

5.5 Animal Testing
Not relevant to applicant; this requirement does not apply.

5.6 Acute Toxicity
No inhalation or ingestion exposure pathway present; this requirement does not apply.

5.7 Skin and Eye Damage
No dermal exposure pathway present; this requirement does not apply.

5.8 Asthmagens
No inhalation exposure pathway present; this requirement does not apply.

5.9 Respiratory Sensitization
No inhalation exposure pathway present; this requirement does not apply.

5.10 Skin Sensitization
No dermal exposure pathway present; this requirement does not apply.

5.11 Skin Absorption
No dermal exposure pathway present; this requirement does not apply.

5.12 Chronic Inhalation Toxicity
No inhalation exposure pathway present; this requirement does not apply.

5.13 Combustibility
The applicant product is an article; this requirement does not apply.

5.14 Fragrances
The applicant product does not contain fragrances; this requirement does not apply.

5.16 Bioaccumulating Compounds
No environmental release exposure pathway present; this requirement does not apply.

5.17 Eutrophication
No environmental release exposure pathway present; this requirement does not apply.

5.18 Aquatic Biodegradability
No environmental release exposure pathway present; this requirement does not apply.

5.19 Toxicity to Aquatic Life
No environmental release exposure pathway present; this requirement does not apply.

ANNEX C (Environmental and Human Health Requirements for Mop Heads with added Preservatives)

5.4 Volatile Organic Compounds (VOCs).
The VOC content of the *product as used* shall contain no more than the current regulatory limits of the Air Resources Board for the State of California (CARB) for its product category.[16] If no CARB limit exists for the product category, Green Seal will determine the acceptable VOC content.

5.5 Animal Testing.
To avoid new animal testing, previous test results will be accepted as evidence of meeting a criterion. When existing data is not available, the preferred methods for new testing include methods that replace, reduce, or refine animal use, particularly those recommended by the Interagency Coordinating Committee on the Validation of Alternative Methods (ICCVAM) or the European Centre for the Validation of Alternative Methods (ECVAM), unless indicated otherwise. In addition, other non-animal (in-vitro) test results, modeling data, data from structural analogs, and other lines of evidence may be accepted, provided that the methods are peer-reviewed and applicable. Specific in vitro or modeling methods may be noted in the standard, but additional options may be accepted by the certification program. Further, a mixture need not be tested if existing information demonstrates that each of the applicable *components* complies with the criterion.

5.7 Skin and Eye Damage.
The product shall not cause *skin corrosion* or cause *serious eye damage.*

For purposes of demonstrating compliance with this requirement, data may be evaluated for each of the product's *components*. If these *components*, at their concentrations in the *undiluted product*, are not shown to cause *skin corrosion* or *serious eye damage*, then the product will not be considered to cause *skin corrosion* or *serious eye damage*. Results from peer-reviewed studies or standard in vivo or in vitro test methods may also be accepted. Testing is not required for any *component* for which sufficient information exists.

Further, a product is considered to cause *skin corrosion* or to cause *serious eye damage* if it has a pH less than or equal to 2.0 or greater than or equal to 11.5, unless data prove otherwise.

5.8 Asthmagens.
The product shall not contain any *components* that have been identified as *asthmagens.*

5.9 Respiratory Sensitization.
The product shall not contain any *components* that have been identified as *respiratory sensitizers*.

5.10 Skin Sensitization.
The product shall not be a *skin sensitizer*. For purposes of demonstrating compliance with this requirement, data may be evaluated for each of the product's *components*. If these *components* are not shown to be *skin sensitizers*, then the product will not be considered to be a *skin sensitizer*.

5.13 Combustibility.
The product shall not be combustible. The product or 99% by weight of the product components shall have a flashpoint above 65.5°C (150°F), as tested using either the Cleveland Open Cup Tester (ASTM D92-05a), the Abel Closed-Cup method (ISO 13736), or the Pensky-Martens Closed-Cup method (ISO 2719). Alternatively, the product shall not sustain a flame when tested using ASTM D 4206 Standard Test Method for Sustained Burning of Liquid Mixtures Using the Small Scale Open-Cup Apparatus.

5.16 Bioaccumulating Compounds.
The product shall not contain any *components* that bioaccumulate or are known to form degradation products that

[16] Instructions for calculating VOC content and methods for determining VOCs can be found in GS-53: Specialty Cleaning Products for Industrial and Institutional Use, Section 3.12. https://www.greenseal.org/gs53.aspx

bioaccumulate. A chemical is considered to bioaccumulate when it has a bioconcentration factor (BCF) ≥ 500 (or log Kow ≥4). The preferred source of data is from OECD TG 305 (for BCF). If the chemical meets the requirement for biodegradability, Section 5.18 herein, it may be considered to not bioaccumulate.

5.17 Eutrophication.
The product shall not contain phosphorus at more than 0.5% by weight.

5.18 Aquatic Biodegradability.
Each of the individual organic *components* shall exhibit ready biodegradability in accordance with the OECD definition, except for polymers. Biodegradability shall be measured according to any of the following methods: ISO 7827, 9439, 10707, 10708, 9408, 14593; OECD Methods 301A – F; or OECD 310. Specifically, within a 28-day test, the *component* shall meet one of the following criteria within 10 days of the time when biodegradation first reaches 10%:

- Removal of Dissolved Organic Carbon(DOC) > 70%
- Biochemical Oxygen Demand (BOD) > 60%
- BOD, as % of Theoretical Oxygen Demand (ThOD) > 60%
- CO_2 evolution, as % of theoretical CO_2 > 60%

Per OECD guidance the 10-day window requirement does not apply to structurally-related surfactant homologues.

Alternative Evaluation Options: Substances that Do Not Exhibit Ready Biodegradability
For organic components in the *product as used* that do not exhibit ready biodegradability, one of the following options may be acceptable:

The manufacturer may demonstrate biodegradability in sewage treatment plants using the Coupled Units Test found in OECD 303A by demonstrating DOC removal > 90%.

OR

The manufacturer may demonstrate that the compound has low aquatic toxicity (acute LC50 ≥ 100 mg/L for algae, daphnia, or fish) and exhibits inherent ultimate biodegradability with biodegradation rates above 70% (measured as BOD, DOC, or COD), per ISO test methods 9887 or 9888 or OECD 302A-C.

Note: Testing is not required for any component for which sufficient information exists concerning its biodegradability, either in peer-reviewed literature or databases. In the absence of experimental data, Quantitative Structure-Activity Relationship data from EPA's BioWin (EpiSuite) models may be considered.

5.19 Toxicity to Aquatic Life.
The *product as used* shall not be toxic to aquatic life. A product is considered not toxic to aquatic life if the lowest available and most representative acute LC_{50} data for fish, daphnia, or algae is greater than or equal to 100 mg/L. For purposes of demonstrating compliance with this requirement, data for each of the product's *components* may be used to calculate a weighted average. The preferred sources of data come from the following appropriate protocols in the International Organization for Standardization (ISO) 7346-2 for fish, OEDC Test Guidance (TG) 203 for fish, OECD TG 202 for daphnia, or OECD TG 201 for algae.