



THE MARK OF ENVIRONMENTAL RESPONSIBILITY

GS-47

GREEN SEAL™ ENVIRONMENTAL STANDARD FOR STAINS AND FINISHES

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GREEN SEAL™

Green Seal is a non-profit organization devoted to environmental standard setting, product certification, and public education. Green Seal's mission is to work towards environmental sustainability by identifying and promoting environmentally responsible products, purchasing, and production. Through its standard setting, certification and education programs, Green Seal:

- identifies products that are designed and manufactured in an environmentally responsible manner;
- offers scientific analyses to help consumers make educated purchasing decisions regarding environmental impacts;
- ensures consumers that any product bearing the Green Seal Certification Mark has earned the right to use it; and
- encourages manufacturers to develop new products that are significantly less damaging to the environment than their predecessors.

The intent of Green Seal's environmental requirements is to reduce, to the extent technologically and economically feasible, the environmental impacts associated with the manufacture, use and disposal of products. Set on a category-by-category basis, Environmental Standards focus on significant opportunities to reduce a product's environmental impact.

Green Seal offers certification to all products covered by its Standards. Manufacturers may submit their products for evaluation by Green Seal. Those which comply with Green Seal's requirements may be authorized to use the Green Seal Certification Mark on products and in product advertising. Manufacturers authorized to use the Green Seal Certification Mark on their product are subject to an ongoing program of testing, inspection, and enforcement. For additional information on Green Seal or any of its programs, contact:

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**GREEN SEAL™ ENVIRONMENTAL STANDARD FOR
STAINS AND FINISHES (GS-47)**

TABLE OF CONTENTS

LIST OF ACRONYMS	5
1.0 SCOPE	6
2.0 DEFINITIONS	6
2.1 CARCINOGENS.....	6
2.2 COATING.....	6
2.3 CONJUGATED OIL VARNISH.....	6
2.4 CLEAR BRUSHING LACQUER.....	7
2.5 CLEAR METAL LACQUERS.....	7
2.6 EXTERIOR.....	7
2.7 FINISH.....	7
2.8 FILM-FORMING AGENTS.....	7
2.9 INGREDIENT.....	7
2.10 INTENTIONAL INTRODUCTION.....	7
2.11 INTERIOR.....	7
2.12 LACQUER.....	7
2.13 LOW SOLIDS COATING.....	7
2.14 MUTAGEN.....	8
2.15 OPAQUE (SOLID COLOR) STAIN.....	8
2.16 OZONE-DEPLETING COMPOUNDS.....	8
2.17 PENETRATING STAIN.....	8
2.18 PIGMENT.....	8
2.19 POST-CONSUMER CONTENT.....	8
2.20 PRIMARY PACKAGE.....	8
2.21 REPRODUCTIVE TOXIN.....	8
2.22 RECOVERED MATERIAL.....	8
2.23 SEALER.....	9
2.24 SEMI-TRANSPARENT COATING.....	9
2.25 SHELLAC.....	9
2.26 SICCATIVE.....	9
2.27 SOURCE-REDUCED PACKAGE.....	9
2.28 STAIN.....	9
2.29 TAKE-BACK PROGRAM.....	9
2.30 THIRD-PARTY CERTIFICATION PROGRAM.....	9
2.31 TONER.....	9
2.32 VARNISHES.....	9
2.33 VOLATILE ORGANIC COMPOUND (VOC).....	9
2.34 WATER-BORNE COATING.....	10
2.35 WATERPROOFING SEALERS.....	10
3.0 PRODUCT-SPECIFIC PERFORMANCE REQUIREMENTS	10
3.1 PENETRATING STAINS.....	10
3.2 WATERPROOFING SEALERS.....	10
3.3 EXTERIOR FILM-FORMING STAINS.....	10
3.4 EXTERIOR FINISHES.....	11
3.4.1 EXTERIOR CLEAR METAL LACQUERS.....	11
3.5 INTERIOR FINISHES.....	12
3.5.1 INTERIOR CLEAR METAL LACQUERS.....	12
4.0 PRODUCT-SPECIFIC ENVIRONMENTAL AND HEALTH REQUIREMENTS	13

4.1	VOC CONTENT LIMITS	13
4.2	VOLATILE AROMATIC COMPOUND CONTENT LIMIT.....	13
4.3	CHEMICAL PROHIBITIONS.....	14
5.0	PRIMARY PACKAGING REQUIREMENTS.....	14
5.1	PACKAGING REQUIREMENTS.	14
5.2	HEAVY METAL RESTRICTIONS.	14
5.3	AEROSOL CANS..	15
5.4	OTHER RESTRICTIONS.....	15
6.0	COMMUNICATION AND LABELING REQUIREMENTS.....	15
	APPENDIX	16

List of Acronyms

ANSI. American National Standards Institute
BHMA. Builders Hardware Manufacturers Association
ASTM. American Society for Testing and Materials
CFR. Code of Federal Regulations
EPA. United States Environmental Protection Agency
FR. Federal Register
FIFRA. Federal Insecticide Fungicide and Rodenticide Act
GHS. Globally Harmonized System of Classification and Labeling of Chemicals
GC. Gas Chromatography
ISO. International Organization for Standardization
IARC. International Agency for Research on Cancer
IRIS. Integrated Risk Information System
MS. Mass spectrometry
NTP. National Toxicology Program
OSHA. Occupational Safety and Health Administration
ppm. Parts per million
UV. Ultra Violet
VOC. Volatile Organic Compounds

GREEN SEAL™ ENVIRONMENTAL STANDARD FOR STAINS AND FINISHES (GS-47)

1.0 SCOPE

This standard establishes environmental, health, and performance requirements for stains and finishes. This standard is intended for products generally applied to metal and wood substrates. The standard includes sealers but does not include paints¹, floor polishes², specialty (industrial, marine, or automotive) coatings, or products sold in aerosol cans. See the Appendix for list of product types included in this standard.

2.0 DEFINITIONS

2.1 Carcinogens. Chemicals listed as a known, probable, reasonably anticipated, or a possible human carcinogen by IARC (Groups 1, 2A, and 2B), NTP (Groups 1 and 2), EPA, IRIS (weight-of-evidence classifications A, B1, B2, C, carcinogenic, likely to be carcinogenic, and suggestive evidence of carcinogenicity or carcinogen potential), or OSHA (as carcinogens under 29 CFR 1910.1003(a)(1)).

2.2 Coating. Liquid, liquefiable, or mastic composition that is converted to a solid adherent film after application to a substrate as a thin layer or compositions that convert from a liquid to a solid after penetration below the surface of a substrate. They are used for decorating, protecting, identifying or to serve some functional purpose such as the filling, or concealing of surface irregularities or the modification of light and heat radiation characteristics. They are intended for on-site application to interior or exterior surfaces of residential, commercial, institutional or industrial surfaces. For the purposes of this standard, the definition of coating does not include paint, recycled latex paint, specialty (industrial, marine or automotive) coatings or paint sold in aerosol cans.

2.3 Conjugated Oil Varnish. A clear or semi-transparent wood coating labeled as such, excluding lacquers or shellacs, based on a natural occurring conjugated vegetable oil (Tung Oil), determined using ASTM Method D-2800 and D-1983, modified with other natural or synthetic resins; a minimum of 50% of the resin solids consisting of conjugated oil.

¹Paints are defined as any pigmented liquid, liquifiable, or mastic composition designed for application to a substrate in a thin layer that converts to an opaque solid film after application that hides the substrate. Paints are covered under the Green Seal Environmental Standard for Paints and Coatings (GS-11) and recycled content (consolidated and reprocessed) latex paints are covered under the Green Seal Environmental Standard for Recycled Context Latex Paint (GS-43).

²Floor polishes are defined as products designed to polish, protect, or enhance floor surfaces by leaving a protective wax, polymer, or resin coating that is designed to be periodically removed (stripped) and reapplied. They are covered under the Green Seal Environmental Standard for Floor-care Products (GS-40).

2.4 Clear Brushing Lacquer. Clear, protective finishes, excluding clear lacquer sanding sealers, intended exclusively for application by brush. These products are typically formulated with nitrocellulose or synthetic resins to dry by solvent evaporation, providing a solid, protective film.

2.5 Clear Metal Lacquers. Ferrous and non-ferrous ornamental metal lacquer and surface protectants as classified under EPA, 40 CFR Part 59, 48848 VOL. 63, No.176 September 1998, last amended 9-99. This classification refers specifically to clear coatings for the protection of polished and satin metal, such as, but not limited to, brass, bronze, aluminum, and stainless steel.

2.6 Exterior. Products formulated and intended for application on outdoor surfaces. If a product is multipurpose (i.e., interior and exterior application), the stricter requirement applies, and the product must meet all the appropriate performance criteria.

2.7 Finish. A clear, semi-transparent or opaque coating that forms a film that sits on or in the surface of the substrate as the final film. Includes varnishes, shellacs, water-borne finishes, polyurethane, and lacquer (including lacquer sanding sealers).

2.8 Film-Forming Agents. A group of chemicals that leave a pliable, cohesive, and continuous covering when applied to their intended substrate to provide a solid, protective dry film.

2.9 Ingredient. Any constituent of a product that is intentionally added or known to be a contaminant that comprises at least 0.01% by weight of the product.

2.10 Intentional Introduction. The act of deliberately utilizing a material in the formation of a package or packaging component where its continued presence is desired in the final package or packaging component to provide a specific characteristic, appearance, or quality.

2.11 Interior. Products formulated and intended for application on indoor surfaces. If a product is multipurpose (i.e., interior and exterior application), the stricter requirement applies, and the product must meet all the appropriate performance criteria.

2.12 Lacquer. A clear or semi-transparent finish, including clear lacquer sanding sealers, formulated with cellulosic or synthetic resins to dry by evaporation without chemical reaction and to provide a solid, protective film.

2.13 Low Solids Coating. A stain or sealer containing 0.12 kilogram or less of solids per liter (1 pound or less of solids per gallon) of coating material as

recommended for application by the manufacturer. The VOC content for Low Solids Coatings shall be calculated including the volume of water and exempt compounds. Existing performance requirements would apply based on the labeled use of the Low Solids Coating.

2.14 Mutagen. A chemical that meets the criteria for category 1 under the GHS, chemicals known to induce heritable mutations or to be regarded as if they induce heritable mutations in the germ cells of humans, which cause mutations in germ cells (United Nations Economic Commission for Europe, GHS. First Edition).

2.15 Opaque (solid color) Stain. A pigmented film-forming stain intended to produce a uniform coating that obscures the grain and color of the substrate, but not its surface texture, also called solid color or solid hide.

2.16 Ozone-Depleting Compounds. A compound with an ozone-depletion potential greater than 0.01 (CFC 11=1) according to the EPA list of Class I and Class II Ozone-Depleting Substances.

2.17 Penetrating Stain. Coating designed to penetrate without forming a surface film and without hiding the grain of the substrate.

2.18 Pigment. A composition of dyes, colorants, or combinations that does not fully obscure the grain of the substrate when applied.

2.19 Post-Consumer Content. 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.

2.20 Primary Package. Package that is the material physically containing and coming into contact with the product, not including the cap or lid.

2.21 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).

2.22 Recovered Material. Material that has been recovered from or otherwise diverted from the waste generated after a material manufacturing process. Recovered material may include post-consumer material, cuttings, trimmings, obsolete inventories, and rejected unused stock, but does not include material capable of being re-used within the process that generated it.

- 2.23 Sealer.** Coatings that are either penetrating or film-forming that blocks materials from penetrating into or leaching out of a substrate.
- 2.24 Semi-Transparent Coating.** A pigmented coating that does not fully obscure the substrate surface texture.
- 2.25 Shellac.** A clear or pigmented finish formulated with the resinous secretions of the lac beetle (*Lacifer lacca*), and formulated to dry by evaporation without a chemical reaction.
- 2.26 Siccative.** A substance added to stains and finishes to promote drying.
- 2.27 Source-Reduced Package.** A package that has at least 20% less material (by weight) compared to containers commonly used for that product type. For bag-in-the-box type packages, the box is included in the weight if the box is used during product use.
- 2.28 Stain.** A clear, semi-transparent or opaque coating labeled and formulated to change the color of a surface but not conceal the grain pattern or texture. Stains can be either penetrating or film-forming and may include toners and sealers.
- 2.29 Take-Back Program.** A company program that has been demonstrated to receive at least 50% of sold containers for recycling or reuse.
- 2.30 Third-Party Certification Program.** A program without any financial interest or stake in the sales of the product or service being certified or other conflict of interest. There must be a standard to base the certification from and the standard must be appropriate and meaningful for its intended purpose. The standard must be publically available and developed with stakeholder input. Certification to the standard must be completed by an independent party (i.e. not the product company), include site inspections and have a monitoring program to verify ongoing compliance.
- 2.31 Toner.** A pigmented penetrating stain intended for use on surfaces to produce a uniform coating that does not obscure the grain or the texture of the wood.
- 2.32 Varnishes.** A clear or semi-transparent finish, excluding lacquer and shellac, formulated to dry by chemical reaction on exposure to air. Varnish may contain small amounts of pigment to color a surface or to control the final sheen or gloss of the finish.
- 2.33 Volatile Organic Compound (VOC).** Any organic compound which participates in atmospheric photochemical reactions as defined by the EPA in 40 CFR §51.100 (s) and has an initial boiling point lower than or equal to 280°C measured at standard conditions of temperature and pressure.

2.34 Water-Borne Coating. A coating that contains 5% or more water as the volatile constituent.

2.35 Waterproofing Sealers. Coatings formulated for the primary purpose of preventing water from penetrating the substrate surface.

3.0 PRODUCT-SPECIFIC PERFORMANCE REQUIREMENTS

The product shall meet the following performance requirements for all of the labeled and marketed uses that apply. All tests shall be performed on product produced by the manufacturer and do not include additives at the point-of-sale.

3.1 Penetrating Stains

- **Blush resistance.** When prepared and tested on a 1 mil thick dry film according to ASTM D 1735 for 2 hours, the penetrating stain shall have a rating of 8 as per ASTM ST 500 after a 24-hour recovery period.
- **Chemical Resistance.** When tested according to ASTM D 1308 using the covered spot test for one hour exposure over the intended substrate, the interior penetrating stain shall demonstrate a rating of 8 after a one-hour recovery period.

3.2 Waterproofing Sealers

- **Water Resistance.** Waterproofing sealers shall show a minimum of 60% water repellent efficiency when tested according to ASTM D 4446.

3.3 Exterior Film-Forming Stains

- **Blush Resistance.** When prepared and tested on a 1 mil thick dry film according to ASTM D 1735 for 2 hours, the exterior film-forming stain shall have a rating of 7 as per ASTM ST 500 after a 24-hour recovery period.
- **Pencil Hardness.** When prepared and tested on a 1 mil thick dry film according to ASTM D 3363 – 92a, the exterior film-forming stain shall have a pencil hardness of 2H or greater.
- **Adhesion.** The film-forming stain shall have an adhesion of 3B or higher after 7 days cure time when tested in accordance with ASTM D3359 on a dried film of ½ to 1 mil thickness.

3.4 Exterior Finishes

- **Pencil Hardness.** When prepared and tested on a 1 mil thick dry film according to ASTM D 3363 – 92a, the exterior finish shall have a pencil hardness of 2H or greater. Exterior clear metal lacquers are exempt from this requirement but must meet the requirement of 3.3.1.
- **Dry Time.** When tested according to ASTM D 1640 the exterior finish shall have a maximum dry-to-touch time of 4 hours. Exterior clear metal lacquers are exempt from this requirement but must meet the requirement of 3.3.1.
- **Adhesion.** The exterior finish shall have an adhesion of 4B or higher after 7 days cure time when tested according to ASTM D3359 on a dried film of ½ to 1 mil thickness.
- **Blister Resistance.** The exterior finish shall have a rating of 10 as per ASTM D 714 when tested according to ASTM D 4585 for 24 hours at 100°F. Exterior clear metal lacquers are exempt from this requirement but must meet the requirement of 3.3.1.

3.4.1 Exterior Clear Metal Lacquers

- **Surface Hardness.** The exterior clear metal lacquer shall have a minimum surface hardness of 3H or higher when tested in accordance with ASTM D3363 (7.1.1) on a dried film of 1/3 to 1 mil thickness.
- **Moisture Resistance.** The exterior clear metal lacquer shall have a moisture resistance of a minimum of 96 hours (4 days) when tested according to ASTM D2247.
- **Chemical Resistance.** The clear metal lacquer shall demonstrate a rating of 10 when tested in accordance to ASTM D-1308; 3-1-2; 6-1-7 for a minimum 15 minutes.
- **Salt Spray Resistance.** The exterior clear metal lacquer shall have a minimum salt spray resistance of 96 hours (4 days) when tested in accordance to ASTM B117.
- **Wear Resistance.** The wear resistance shall be 4 liters or higher when tested in accordance with ASTM D 968 , applying the coating in accordance with ASTM D823 with silica, and on a 1/3 to 1 mil dry film thickness measured in accordance with ASTM D 1005, D1186, or D1400.

- **Reversibility.** When tested in accordance with ASTM D-4752-87 with a maximum of 20 double rubs for complete removal on a 1/3 to 1 mil dry film, the coating must be able to be removed by nothing stronger than acetone after an air dry of 72 hours.
- **UV Resistance.** The exterior clear metal lacquer shall have a UV resistance of a minimum of 144 hours when tested with ASTM G154. Test specimen must be prepared and exposed in accordance with ASTM G 151.

3.5 Interior Finishes

- **Pencil Hardness.** When prepared and tested on a 1 mil thick dry film according to ASTM D 3363 – 92a, the interior finish shall have a pencil hardness of 2H or greater. Interior clear metal lacquers are exempt from this requirement but must meet the requirement of 3.4.1.
- **Chemical Resistance.** When tested in accordance with ASTM D 1308 for 1 hour with the covered spot test and 1 hour recovery period over the intended substrate, the interior finish shall demonstrate a rating of 8.
- **Adhesion.** The interior finish shall have an adhesion of 4B or higher after 7 days cure time when tested in accordance with ASTM D3359 on a dried film of ½ to 1 mil thickness.

3.5.1 Interior Clear Metal Lacquers

- **Surface Hardness.** The interior clear metal lacquer shall have a minimum surface hardness of 3H or higher when tested in accordance with ASTM D3363 (7.1.1) on a dried film of 1/3 to 1 mil thickness.
- **Moisture Resistance.** The interior clear metal lacquer shall have a minimum moisture resistance of a minimum of 48 hours (2days) when tested according to ASTM D2247.
- **Salt Spray Resistance.** The interior clear metal lacquer shall have a minimum salt spray resistance of 24 hours (1 day) hours when tested in accordance with ASTM B117.
- **Wear Resistance.** Wear resistance. The wear resistance shall be 8 liters or higher when tested in accordance with ASTM D 968 , applying the coating in accordance with ASTM D823 with silica, and

on a 1/3 to 1 mil dry film thickness measured in accordance with ASTM D 1005, D1186, or D1400.

- **Reversibility.** When tested in accordance to ASTM D-4752-87 with a maximum of 20 double rubs for complete removal on a 1/3 to 1 mil dry film, the coating must be able to be removed by nothing stronger than acetone after an air dry of 72 hours.
- **Perspiration Resistance.** The interior clear metal lacquer shall have a minimum of 2 cycles when tested in accordance to ANSI/BHMA A156.18-2006.

4.0 PRODUCT-SPECIFIC ENVIRONMENTAL AND HEALTH REQUIREMENTS

4.1 VOC Content Limits. The VOC concentration of the product shall not exceed those listed below in grams of VOC per liter of product as determined by ASTM D6886-03 Standard Test Method for Speciation of the VOCs in Low VOC Content Waterborne Air-Dry Coatings by Gas Chromatography using 280°C as a specified limit. Alternatively, ISO 11890-2 Paints and Varnishes --Determination of VOC content, Part 2: GC/MS method, may be used, but must use 280°C as a marker. Another scientifically validated test method may be used if accompanied by justification for the method modification and documented in sufficient detail. The calculation of VOC shall exclude water.

Table 1: VOC limits on stains and finishes intended and labeled for use on wood and select metal substrates

Coating type		VOC Content (g/L as applied)
Finishes	Varnishes	350
	Conjugated Oil Varnish	450
	Lacquer	550
	Clear Brushing Lacquer	680
	Shellacs/Pigmented	550
	Shellacs/Clear	730
Stains		250
Sealer		200
Waterproof Sealers		250
Low Solids Coating		120

4.2 Volatile Aromatic Compound Content Limit. The product shall contain no more than 0.5% by weight of sum total of volatile aromatic compounds. Testing for

the concentration of these compounds will be performed if they are determined to be present in the product during a materials audit.

4.3 Chemical Prohibitions. The product shall not contain the following ingredients:³

- Alkylphenol ethoxylates
- Carcinogens
- Mutagens
- Reproductive toxins
- Hazardous air pollutants
- Ozone depleting compounds
- Phthalates
- Heavy metals including lead, mercury, cadmium, hexavalent, chromium, and antimony in the elemental form or compounds.
- Halogenated solvents
- Formaldehyde donors

An exception shall be made for titanium dioxide and, for products that are pre-tinted by the manufacturer, carbon black. Carbon black allowed under this exception shall be less than or equal to 1% by weight of the product.⁴ Cobalt or manganese shall also not be added as an ingredient with the exception of cobalt or manganese salts used as a siccative in alkyd stains and finishes that dry by oxidative crosslinking and polymerization. These may be used up to a concentration not exceeding 0.06 % by weight in the end product, measured as cobalt metal. Cobalt or manganese in pigments are also exempted from this requirement.

5.0 PRIMARY PACKAGING REQUIREMENTS

5.1 Packaging Requirements. The packaging shall contain 25% recovered material content. An exception shall be made for packaging that can be recycled as part of a manufacturer's take-back program or a source-reduced package.

5.2 Heavy Metal Restrictions. Heavy metals, including lead, mercury, cadmium, and hexavalent chromium, shall not be intentionally introduced. Further, the sum of the concentration levels of these metals present shall not exceed 100 ppm by weight (0.01%); an exception is allowed for packages that would not exceed this maximum level but for the addition of recovered materials. Further, intentional introduction does not include the use of one of the metals as a processing aid or intermediate to impart certain chemical or physical changes during manufacturing, where the incidental retention of a residual of that metal in

³ As clarification, crystalline silica is only prohibited according to the specific form as listed.

⁴ Titanium Dioxide: EC Number 236-675-5, CAS Number 13463-67-7

Carbon Black: EC Number 215-609-9, CAS Number 1333-86-4

the final package or packaging component is not desired or deliberate, if the final package or packaging component complies with the incidental concentration restrictions of 100 ppm.

5.3 Aerosol cans. Aerosol cans are prohibited.

5.4 Other Restrictions. Phthalates, bisphenol A, and chlorinated compounds are prohibited from being intentionally introduced; an exception is allowed for packages that would not have added these compounds but for the addition of recovered material.

6.0 COMMUNICATION AND LABELING REQUIREMENTS

6.1 The manufacturer's label shall include a statement encouraging consultation with local authorities regarding proper disposal or recycling opportunities for leftover product and packaging. The label shall include instructions for appropriate purchasing, adequate ventilation during drying time, proper use of the product or include a reference to consumer education information by print, online or other accessible media. If the manufacturer provides a take-back program, the label shall include instructions on how the product and packaging can be returned.

6.2 Whenever the product makes a claim (e.g., on the product or in advertising) that it has been certified to this standard, it shall be based on a third-party certification program with an on-site audit and state::

“This product meets the Green Seal™ Environmental Standard for Stains and Finishes, GS-47, based on product performance, reduced use of hazardous substances, and reduced volatile organic compound (VOC) content.”

APPENDIX

Product categories included in the scope of GS-47 Stains and Finishes Standard

Product category	Types
Finishes	Clear Brushing Lacquer
	Lacquer
	Varnishes
	Shellacs/Pigmented
	Conjugated Oil Varnish
	Shellacs/Clear
Stains	Film forming
	Penetrating
Sealers	
Low solids coating	