



GS-47

**GREEN SEAL™ STANDARD FOR
STAINS AND FINISHES**

**FIRST EDITION
SEPTEMBER 18, 2009**

Green Seal, Inc. • 1001 Connecticut Ave. NW, Ste 872 • Washington, DC USA 20036-5525
(202) 872-6400 • FAX (202) 872-4324 • www.greenseal.org

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THE MARK OF ENVIRONMENTAL RESPONSIBILITY

GREEN SEAL™

Green Seal is a non-profit organization whose mission is to use science-based programs to empower consumers, purchasers, and companies to create a more sustainable world. Green Seal sets leadership standards that aim to reduce, to the extent technologically and economically feasible, the environmental, health, and social impacts throughout the life-cycle of products, services, and companies. The standards may be used for conformity assessment, purchaser specifications, and public education.

Green Seal offers certification of products, services, and companies in conformance with its standards. For additional information on Green Seal or any of its programs, contact:

Green Seal
1001 Connecticut Avenue, NW, Suite 827
Washington, DC 20036-5525
(202) 872-6400
greenseal@greenseal.org
www.greenseal.org

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TABLE OF CONTENTS

FOREWORD	4
ACRONYMS AND ABBREVIATIONS	5
1.0 SCOPE	6
2.0 PRODUCT-SPECIFIC PERFORMANCE REQUIREMENTS	6
2.1 PENETRATING STAINS	6
2.2 WATERPROOFING SEALERS	7
2.3 EXTERIOR FILM-FORMING STAINS	7
2.4 EXTERIOR FINISHES	7
2.4.1 EXTERIOR CLEAR METAL LACQUERS	7
2.5 INTERIOR FINISHES	8
2.5.1 INTERIOR CLEAR METAL LACQUERS	9
3.0 PRODUCT-SPECIFIC ENVIRONMENTAL AND HEALTH REQUIREMENTS	9
3.1 VOC CONTENT LIMITS	9
3.2 VOLATILE AROMATIC COMPOUND CONTENT LIMIT	10
3.3 CHEMICAL PROHIBITIONS:	10
4.0 PRIMARY PACKAGING REQUIREMENTS	11
4.1 PACKAGING REQUIREMENTS	11
4.2 HEAVY METAL RESTRICTIONS	11
4.3 AEROSOL CANS	11
4.4 OTHER RESTRICTIONS	11
5.0 COMMUNICATION AND LABELING REQUIREMENTS	11
ANNEX A	13
APPENDIX 1	17

FOREWORD

General. The final issued standard was developed in an open and transparent process with stakeholder input that included producers, users, and general interests.

The requirements in the standard are based on an assessment of the environmental, health, or social impacts associated with the products, services, or organizations covered in the scope of the standard. The requirements included in the standard are subject to revision. Provisions for safety have not been included in this standard. This standard neither modifies nor supersedes laws and regulations. Compliance with this Standard is not a substitute for, and does not assure, compliance with any applicable law or regulations. Compliance with all applicable laws and regulations is a required prerequisite for the manufacturing and marketing of the products. This standard (and any corresponding conformity assessment) presumes compliance with all applicable laws and regulations.

Products, services, or organizations that are substantially similar to those covered by this standard in terms of function and life cycle considerations may be evaluated against the intent of the requirements of this standard, accounting for relevant differences between the intended scope of the Standard and the actual product, service, or organization to be evaluated.

This standard may not anticipate features of the product that may significantly, and undesirably, increase its impact on the environment, health, or society. In such a situation, Green Seal will ordinarily amend its standards to account for the unanticipated environmental, health, and societal impacts.

Normative references (e.g., other standards) in this standard intend to refer to the most recent edition of the normative reference.

Edition. This version is the First Edition from September 18, 2009 (with editorial revisions made on October 1, 2011).

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Tests may be required by the standard that involve safety considerations. Adequate safeguards for personnel and property should be employed in conducting such tests.

ACRONYMS AND ABBREVIATIONS

ANSI. American National Standards Institute

BHMA. Builders Hardware Manufacturers Association

ASTM. ASTM International, a standard setting organization formerly known as the American Society for Testing and Materials

CFR. Code of Federal Regulations

EPA. United States Environmental Protection Agency

GHS. Globally Harmonized System of Classification and Labeling of Chemicals

ISO. International Organization for Standardization

ppm. Parts Per Million

UV. Ultra Violet

VOC. Volatile Organic Compounds

GREEN SEAL™ 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 Appendix 1 for an example list of products included in this standard.

Words and phrases described in the standard that appear in *italics* have a corresponding definition located in the definition section of the standard, Annex A.

2.0 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.

2.1 Penetrating Stains

- **Blush resistance.** When prepared and tested on a 1 mil thick dry film according to ASTM International (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.

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).

2.2 Waterproofing Sealers

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

2.3 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.

2.4 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 2.4.1.
- **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 2.4.1.
- **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 2.4.1.

2.4.1 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 an ultra violet (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.

2.5 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 2.5.1.
- **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.

2.5.1 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 the American National Standard Institute (ANSI)/Builders Hardware Manufacturers Association (BHMA) A156.18-2006.

3.0 PRODUCT-SPECIFIC ENVIRONMENTAL AND HEALTH REQUIREMENTS

3.1 VOC Content Limits. The *volatile organic compound (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, International Organization for Standardization (ISO) 11890-2 Paints and Varnishes --

Determination of VOC content, Part 2: Gas-Chromatographic 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.

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

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

3.2 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.

3.3 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

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

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 and manganese may be allowed no more than 0.06% as active metal.

4.0 PRIMARY PACKAGING REQUIREMENTS

4.1 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*.

4.2 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 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.

4.3 Aerosol cans. Aerosol cans are prohibited.

4.4 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*.

5.0 COMMUNICATION AND LABELING REQUIREMENTS

5.1 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.

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

5.2 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™ Standard for Stains and Finishes, GS-47, based on product performance, reduced use of hazardous substances, and reduced volatile organic compound (VOC) content.

ANNEX A – Normative

Definitions of Terms

(note that the defined terms are italicized throughout the standard)

Carcinogen. A chemical listed as a known, probable, reasonably anticipated, or a possible human carcinogen by International Agency for Research on Cancer (Groups 1, 2A, and 2B), National Toxicology Program (Groups 1 and 2), U.S. Environmental Protection Agency (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 Occupational Safety and Health Administration (as carcinogens under 29 Code of Federal Regulations (CFR) 1910.1003(a)(1)).

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.

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.

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.

Clear Metal Lacquer. 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.

Exterior. A product 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.

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*).

Film-Forming. 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.

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.

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.

Interior. A product 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.

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.

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.

Mutagen. A chemical that meets the criteria for category 1 under the Globally Harmonized System of Classification and Labeling of Chemicals (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).

Opaque. 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.

Ozone-Depleting Compound. 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.

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

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

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.

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

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).

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.

Sealer. A *coating* that is either *penetrating* or *film-forming* that blocks materials from *penetrating* into or leaching out of a substrate.

Semi-Transparent. A *pigmented coating* that does not fully obscure the substrate surface texture.

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.

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.

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*.

Take-Back Program. A company program that has been demonstrated to receive at least 50% of sold containers for recycling or reuse.

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.

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.

Varnish. 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*.

Volatile Organic Compound. 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.

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

Waterproofing Sealer. A *coating* formulated for the primary purpose of preventing water from penetrating the substrate surface.

APPENDIX 1 - Informative

Examples of products included and excluded in the scope of GS-47:

Products Included in GS-47

- *Clear brushing lacquer*
- *Conjugated oil varnish*
- *Finishes*
- *Lacquer*
- *Low solids coating*
- *Sealers*
- *Shellacs*
- *Stains*
- *Varnish*

Products Excluded from GS-47

- Aerosol packaged products
- Architectural paints and coating (included in GS-11)
- Floor finish and finish strippers (included in GS-40)
- Graffiti remover (included in GS-52 and GS-53)
- Paint strippers
- Specialty coatings (e.g., industrial, marine, or automotive)