



April 10, 2009

Green Seal is in the process of developing an Environmental Standard for Stains and Finishes, GS-47. Comments from the public were solicited on a Proposed Standard from June 28, 2008 until August 15, 2008.

Included in this document are the comments received on the Proposed Standard for Stains and Finishes GS-47, August 15, 2008 with responses and explanation on how the Proposed Standard was modified accordingly.

By participating in Green Seal's standard setting process, the following organizations that provided comments played an important role in Green Seal's effort to encourage the design, manufacture and end use of environmentally superior products. Their assistance and involvement is greatly appreciated:

Armstrong-Clark Company
Dow Coatings Solutions
Emulsion Polymers Council
Fuhr Industrial
G. J. Nikolas Co., Inc.
Lyondell Chemical Company
National Paint and Coatings Association
Nawkaw Corporation
Rudd Company, Inc.
Sherwin Williams Company
Waterlox

Table of Contents

1.0 SCOPE 3

2.0 DEFINITIONS..... 5

 2.1 COATING..... 5

 2.2 CLEAR BRUSHING LACQUER..... 6

 2.3 CLEAR WOOD FINISHES 6

 2.4 FINISH..... 7

 2.5 INGREDIENT 7

 2.6 LACQUERL 7

 2.7 OIL FINISHES 8

 2.8 POST-CONSUMER CONTENT..... 8

 2.9 SEMI-TRANSPARENT 9

 2.10 STAIN..... 9

 2.11 SHELLAC..... 9

 2.12 VARNISHES 10

 2.13 VOLATILE ORGANIC COMPOUND (VOC) 10

 2.14 RECYCLABLE 12

 2.15 WATER-BORNE COATING 13

3.0 PRODUCT SPECIFIC PERFORMANCE REQUIREMENTS 13

 EXTERIOR WOOD STAINS

 3.1 BLISTER RESISTANCE..... 14

 3.2 ADHESION..... 14

 3.3 ABRASION RESISTANCE. 15

 3.4 CHEMICAL RESISTANCE..... 16

 INTERIOR WOOD STAINS

 3.5 PENCIL HARDNESS 17

 3.6 BLISTER RESISTANCE..... 18

 EXTERIOR WOOD FINISH

 3.7 PENCIL HARDNESS 18

 3.8 DRY TIME 19

 3.9 ADHESION..... 19

 3.10 CHEMICAL RESISTANCE 19

 INTERIOR WOODFINISH

 3.11 BLISTER RESISTANCE..... 20

 CLEAR METAL LACQUER

 3.12 ADHESION..... 21

 3.13 SURFACE HARDNESS..... 21

 3.14 MOISTURE RESISTANCE 21

 3.15 SALT SPRAY RESISTANCE 22

 3.16 WEAR RESISTANCE 22

 3.17 REVERSIBILITY 22

 3.18 UV RESISTANCE 23

4.0 ENVIRONMENTAL AND HEALTH REQUIREMENTS 23

5.0 PACKAGING REQUIREMENTS 29

The language from the Proposed Standard is included in bold, followed by comments, and Green Seal's response to the comments. Any modifications to the language in the Proposed Revised Standard are included in italics in the response.

1.0 Scope

This standard establishes environmental, health, and performance requirements for stains and finishes. It applies to stains that are water-borne, solvent-borne, semi-transparent or opaque, and finishes such as varnishes, shellacs, water-based finishes, polyurethane, lacquer, and oil finishes. Also included are clear metal lacquers, the classification of which refers specifically to clear coatings for the protection of polished and satin metal including ferrous and non ferrous metal. Finishes for floors, standard paint, and recycled paint and floor stripper products are not included in this standard.

Comment:

1) In order to avoid confusion from use of potentially ambiguous terminology, we believe the scope of GS-47 as it relates to wood coatings should be based on the generally well developed and well-understood regulatory definitions found in established architectural coating VOC regulations. We recommend the following categories for wood coatings: stains, varnishes, lacquers (including lacquer sanding sealers), shellacs, sealers, waterproofing sealers and low solids coatings, which may be labeled for use in any of the other categories included in the scope of the standard.

2) Language in the Scope section appears to exclude varnishes and lacquers for floors based on Section 2.0 Definitions for "Clear wood finishes" and "Finish" by stating: "Finishes for floors...are not included in this standard." But language in the Background Document defines "Floor finishes" differently, as "...products designed to polish, protect or enhance floor surfaces by leaving a protective wax, polymer, or resin coating that will be periodically removed (stripped) and reapplied." If the intent is to include architectural coatings for wood floors, the reference to "floor finishes" should be clarified.

Comment:

It is unclear as written as to whether GS-47 applies to specialty coatings including industrial ("shop application" Original Equipment Manufacture (OEM) coatings - i.e. coatings applied to new furniture in a manufacturing facility), marine or automotive coatings.

[- - -] recommends that Green Seal specifically exclude specialty (industrial, marine or automotive) coatings from GS-47 as Green Seal did in GS-11 as detailed below:

This standard establishes environmental requirements for paints and coatings. The standard includes wall, anti-corrosive, and reflective coatings, floor paints and primers and undercoats. The standard does not include stains, clear finishes, recycled (consolidated or reprocessed) latex paint, specialty (industrial, marine or automotive) coatings, or paint sold in aerosol cans. "Wood coatings applied in a industrial setting need

to be formulated differently than coatings applied in the field to wood substrates since they need to be able to apply wood coatings quickly yet effectively in order to stay competitive. Many continuous wood coating operations are run on conveyor belts at high speeds with numerous stations where coatings are applied. In addition, wood furniture coatings do not simply protect the substrate, but enhance its qualities and looks, and as such it is very difficult to formulate coatings and application procedures that will still provide an acceptable finish. Also, many OEM surface coating operations have add-on controls to collect and treat the VOC's that may result from coating application, so VOC content is not a primary concern. Bottom-line, coatings intended for OEM application are high performance coatings with higher VOC content than those listed in the proposed GS-47; therefore Green Seal should specifically exclude OEM stains and finishes.

Further, stains and finishes for marine and automotive applications need to be high performance as well - the limits included in the proposed GS-47 are not feasible for marine and automotive applications.

Response:

The scope of the proposed GS-47 Stains and Finishes Standard includes stains that are water-borne, solvent-borne, semi-transparent or opaque, and finishes such as varnishes, shellacs, water-based finishes, polyurethane, and lacquer (including lacquer sanding sealers). Also included are sealers, waterproofing sealers and clear metal lacquers, the classification of which refers specifically to clear coatings for the protection of polished and satin metal including ferrous and non ferrous metal. Stains and finishes for wood floors that meet the requirements of this standard may be included in the scope. However, floor polishes 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 are addressed in the Green Seal GS-40 Industrial and Institutional Floor-care products Standard and thus are excluded from the GS-47 Stains and Finishes Standard. Also excluded are paints and coatings which are covered under the Green Seal Environmental Standard for Paints and Coatings GS-11 and recycled content (consolidated and reprocessed) latex paints covered under the Green Seal Environmental Standard for Recycled Context Latex Paint GS-43 Standard paint, recycled paint and floor stripper. Specialty coatings including industrial (shop application Original Equipment Manufacture (OEM) coatings - i.e. coatings applied to new furniture in a manufacturing facility), marine or automotive coatings are not included in this standard. The limits included in the proposed GS-47 are not feasible for marine and automotive applications therefore these products are excluded from the scope of the current GS-47 Stains and Finishes Standard. In order to avoid confusion from use of potentially ambiguous terminology, the scope of the current GS-47 Stains and Finishes Standard has been rephrased as follows:

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. This also includes sealers. The

standard does not include paints¹, floor polishes², specialty (industrial, marine, or automotive) coatings, or products sold in aerosol cans.

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).

² Floor 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 in the Green Seal Environmental Standard for Floor-care Products (GS-40).

2.0 DEFINITIONS

2.1 Coating. Liquid, liquefiable, or mastic composition that is converted to a solid adherent film after application to a substrate as a thin layer and is 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 and is intended for on-site application to interior or exterior surfaces of residential, commercial, institutional or industrial wood or metal surfaces For the purposes of this standard, the definition of coating does not include paints, recycled latex paint, specialty (industrial, marine or automotive) coatings or paint sold in aerosol cans.

Comment:

Why would you not include industrially applied (OEM) coatings along with AIM coatings?

Response:

High performing industrial products such as those that are factory-applied or other original equipment manufacturer (OEM) coatings require additional considerations due to different performance requirements (e.g. adhesion, dry-time). The limits included in the proposed GS-47 are not feasible for high performing industrial products and therefore they excluded in the scope in the standard.

Comment:

The definition should not be limited to compositions that form a film on the surface of a substrate. It should also include compositions that convert from a liquid to a solid after penetration below the surface of a substrate (e.g., penetrating coatings for wood).

Response:

Green Seal agrees with the comment and has modified the definition accordingly:

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.

2.2 Clear Brushing Lacquer. Clear brushing lacquer, a clear, durable protective wood finish that combines the look of a traditional lacquer with the ease of brush application. Clear brushing lacquer can be used over bare or stained wood as well as metal.

Comment:

The difference between "clear brushing lacquer" and other types of lacquer is not clear from this definition. For example, aren't other types of lacquers applied by brush?

Response:

Clear Lacquers are generally applied by Spray Gun. Clear Brushing and Wipe on Lacquers are sometimes used in areas where spraying is not practical. Clear Brushing Lacquer must dry slower than Clear Spray Lacquer so the applicator does not dry out, and to allow the coating to flow out and level.

Comment:

The word durable should be taken out of the definition. This is an idea, or presumption, not a fact for the definition.

Response:

Green Seal agrees with the comment and has modified the definition accordingly:

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.

2.3 Clear Wood Finishes. Coatings including lacquers and varnishes, applied to wood substrates to provide a transparent or translucent solid film.

Comment:

Waterborne coatings need to be included in this definition. Maybe by stating "including lacquers and varnishes (both water-borne and solvent-borne)."

Response:

Green Seal agrees with your comments and has made the necessary corrections accordingly.

Clear Wood Finishes. Coatings including lacquers and varnishes applied to wood substrates to provide a transparent or translucent solid film.

2.4 Finish. A clear coating that sits on or in the surface of the wood.

Comment:

The definition should include semi-transparent as well as clear coatings

Comment:

Finish is typically referred to as the "topcoat." This definition needs to include "semi-transparent as well as clear," and end with "as the final film."

Response:

Green Seal agrees with the comment and has modified the definition accordingly:

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).

2.5 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.

Comment:

Ingredients should include component present at 1% by weight or 0.1% by weight for carcinogens to be consistent with most state and federal regulations.

Response:

Green Seal does not believe that the OSHA reporting level of 0.1% is stringent enough to protect human health and environment. In development of a leadership standard, Green Seal desires to set criteria that reward those manufacturers which go above the minimum statutory and regulatory requirements. In development of a leadership standard, Green Seal desires to set criteria that reward those manufacturers which go above the minimum statutory and regulatory requirements. The definition of ingredient (as defined by 0.01% by weight or 100 ppm) is appropriate as it is used in other Green Seal standards, including the Green Seal standard for Recycled-Content Latex Paint (GS-43) and the Green Seal Environmental Standard for Paints and Coatings (GS-11).

2.6 Lacquer. A coating substance consisting of resinous materials, such as cellulose esters or ethers, shellac, or gum or alkyd resins, dissolved in ethyl alcohol or other solvent that evaporates rapidly on application, leaving a tough,

adherent film. It is flexible, durable, and easy to maintain. A lacquer is suitable to coat both wood and metal.

Comment:

The following definition is recommended: “A clear or semi-transparent coating formulated with cellulosic or synthetic resins to dry by evaporation without chemical reaction and to provide a solid, protective film”

Response:

Green Seal agrees with the comment and has modified the definition accordingly:

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.

2.7 Oil finishes. Natural finishes derived from plants. They are used to treat and preserve wood.

Comment:

An overbroad, confusing category. Also, the description of such products as “natural” can be misleading. While its true oil finishes contain plant-derived materials, they almost always also contain other ingredients not derived from plants. For consistency with VOC regulations and to avoid confusion, oil finishes intended to penetrate and harden below the surface of the wood are best categorized as clear or semi-transparent stains, while oil finishes intended to build a surface film are best categorized as clear or semi-transparent varnishes.

Response: Green Seal agrees with your comments and has deleted the definition of oil finishes. Oil finishes shall be categorized as clear or semi-transparent varnishes.

2.8 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.

Comment:

Post-industrial material that is commonly disposed, and not commonly reused within an original manufacturing process, should be included in the definition of post-consumer content.

Response:

Post industrial material is already included in the definition of recovered material. Recovered material is defined as 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.

2.9 Semi-Transparent. A pigmented composition intended for use on wood surfaces to produce a uniform coating that does not fully obscure the grain or the texture of the wood.

Comment:

Why not include dyes or pigments or combinations?

Response:

The definition of semi-transparent stains is intended to include dyes, pigments, or combinations. A pigment is a composition including dyes, colorants or combinations that do not fully obscure the wood grain when applied. In order to avoid potential ambiguity and for clarification purposes, Green Seal has added the definition of pigment to the GS-47 Stains and Finishes Standard.

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

2.10 Stain. Any color coating that is applied in single or multiple coats directly to the substrate. Includes, but is not limited to, non-grain-raising stains, equalizer stains, sap stains, body stains, no-wipe stains, penetrating stains, and toners.

Comment:

The following definition is recommended: “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.”

Response:

Green Seal agrees with the comment and has modified the definition accordingly to include the definition used by the Forest Products Laboratory.

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.

2.11 Shellac. A natural resin, with an alcohol base, and gives a dark coating. It is available in two forms - flaked and liquid, both mixed with alcohol to acquire a thin consistency.

Comment:

Recommended definition: “A coating formulated solely with the resinous secretions of the lac beetle (*Lacifer lacca*), and formulated to dry by evaporation without a chemical reaction.”

Response:

Green Seal agrees with the comment and has modified the definition accordingly:

*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.*

2.12 Varnishes. Clear wood finishes formulated with various resins to dry by chemical reaction

Comment:

The following definition is recommended: “A clear or semi-transparent surface coating, 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.”

Response:

Green Seal agrees with the comment and has modified the definition accordingly:

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.

2.13 Volatile Organic Compound (VOC). Any organic compound having an initial boiling point lower than or equal to 280°C measured at standard conditions of temperature and pressure.

Comment:

Why not use the definition of a VOC as recognized by EPA?

Response:

The definition of VOC as given by the U.S. EPA addresses only VOC in terms of smog production potential and does not properly address indoor air quality. EPA’s Method 24 has historically been the method for testing for VOC limits, but even EPA admits to the shortcoming of the methodology. For this reason, gas chromatography/mass spectrometer tests like ASTM D6886 and ISO 11890-2 have been proposed as better ways to determine VOCs, which separate compounds according to boiling point and is a more accurate determination of VOC particularly given lower VOC levels, which are increasingly possible with advances in chemical formulation. Maintaining the U.S. EPA definition in terms of smog production potential would not be consistent with the newer methodology cited in the “VOC Limit” section; therefore, Green Seal has chosen

to adopt the European definition in favor of the U.S. definition as it is consistent with advancements in chemical formulation and VOC determination and it is a more preventative approach in line with Green Seal's overall mission.

Comment:

[- - -] strongly opposes the proposed VOC definition which includes a boiling point of 280°C or lower. We believe that the VOC definition should include a boiling point cutoff of less than or equal to 250°C to be consistent with the EU definition found in Directive 2004/42/CE that covers the same products as this standard. The change in the definition from 250°C to 280°C is arbitrary. An advantage of using the EU definition is consistency, and the proposed boiling point change to 280°C will create yet another definition—and a barrier to compliance and use of the GS-47 standard. Additionally, it is now recognized that higher boiling compounds with their typically lower vapor pressures have reduced atmospheric availability resulting in retention of significant proportions of those compounds in the coating substrate and film. Thus the impact of any compounds that have boiling points between 250°C to 280°C is greatly reduced.

Comment:

[- - -] has reviewed the proposed standard and opposes the proposed VOC definition with an initial boiling point limit of 280°C or less. [- - -] strongly recommends that a limit of 250°C continue to be used. The proposed definition is inconsistent with the EU definition of 250°C found in Directive 2004/42/CE which also applies to the Stains and Finishes. Further, the change in the definition from 250°C to 280°C is arbitrary, has little established benefit to the environment, and will result in added cost in reformulation in order to comply with this modification in the VOC definition. Use of the EU definition of a compound with a boiling point less than or equal to 250°C will avoid the creation of a new definition and a thus a barrier to compliance and use of the GS-47 standard internationally. Also, it is now recognized that compounds with higher boiling points and lower vapor pressure, such as those in the range of 250°C to 280°C, typically have reduced atmospheric availability due to the retention of significant proportions of these compounds in the coating substrate and film. These compounds are therefore unavailable for atmospheric reactions leading to ozone formation, minimizing any potential environmental impact of compounds with initial boiling points between 250°C to 280°C.

Response:

Green Seal adopted the European Union's approach to defining VOCs in terms of boiling point, at a limit of 280°C, due to the realization that maintaining the original 250°C boiling point limit in the European Union's approach may exclude certain semi-volatile compounds that may be partially retained in the film after the 250°C marker (such as those in the range of 250°C to 280°C). For example, under the European definition of boiling point at a cut-off of 250°C, compounds like 2,2,4-Trimethyl-1,3-pentanediol monoisobutyrate (TMP-MIB), CAS No 25265-77-4, a widely-used coalescing agent considered a VOC according to the current U.S. EPA definition (due to its possible contribution to atmospheric

photochemical smog) would be excluded since it exudes above the 250°C mark. Green Seal believes that it is necessary to raise the boiling point cut-off to 280°C in order to include semi-volatile compounds such as TMP-MIB that may be partially retained in the film after the 250°C mark.

Comment:

The VOC definitions in GS-11 and GS-47 should be identical and recognize the EPA definition in 40 CFR 51.100

Response:

Green Seal has made the necessary changes accordingly so that the definition of VOC is recognizes the EPA definition in 40 CFR 51.100.

Volatile Organic Compound (VOC). Any organic compound which participates in atmospheric photochemical reactions as defined by the U.S. 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.

Comment:

Recommendations for new definitions

Low Solids Coating: A coating containing 0.12 kilogram or less of solids per liter (one pound or less of solids per gallon) of coating material. The VOC content of a low solids coating is the actual VOC content, including the volume of any water and exempt compounds.

Waterproofing Sealer: A clear or semi-transparent, penetrating, exterior wood coating labeled and formulated for the primary purpose of preventing the penetration of water.

Sealer: A clear coating labeled and formulated for application to wood to prevent subsequent coatings from being harmed by, causing harm to or being absorbed by the wood.

Response:

Green Seal has added the recommended definitions to the GS-47 Stains and Finishes Standard. Green Seal has determined that due to their molecular contents stains and finishes are already low solid coatings and has elected not to add low solid coating category to the current standard.

Sealers. Coatings applied to either block materials from penetrating into or leaching out of a substrate, to prevent subsequent coatings from being absorbed by the substrate, or to prevent harm to subsequent coating by materials in the substrate.

Waterproofing Sealers. Coatings formulated for the primary purpose of preventing penetration of porous substances by water.

2.14 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

Comment:

Are you trying to define the word "recyclable" or the term "recyclable packaging?"

Response:

The recyclable definition used follows the guidance provided by the Federal Trade Commission (FTC) and refers to recyclable material such as packaging.

2.15 Water-Borne Coating. One which, as supplied and applied, contains more than 5% of its volatile constituent as water.

Comment:

To be consistent, this should state the following:

A coating that contains 5% or more water as the volatile constituent.

Response:

Green Seal agrees with your comments and has made the necessary corrections accordingly.

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

3.0 PRODUCT SPECIFIC PERFORMANCE REQUIREMENTS

General Comments

Comment:

Recommended Additional Performance Requirements

3.7 Waterproofing Sealers

3.7.1 Water Resistance, ASTM D 4446, minimum 60% water repellent efficiency

3.8 Sealers

3.8.1 No performance requirements necessary

Response:

Green Seal agrees with your comments, sealers shall meet the performance requirements of stains as per their intended use. Waterproofing sealers shall meet the following performance requirement

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

Exterior Stains

Comment:

A mildew-resistance requirement should be considered for all exterior formulations (for example, ASTM D5590-94: Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement and/or ASTM D5589-97: Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Algal Defacement).

Response:

Any product that is marketed as having an antimicrobial or mildew resistant property must be registered under the U.S. EPA Federal Insecticide Fungicide and Rodenticide Act (FIFRA). Green Seal believes that mildew growth will be adequately regulated by the U.S. EPA under FIFRA. While the manufacturer may elect to run mildew resistance testing, Green Seal will not request in the standard as the standard is intended to highlight key performance criteria which may be compromised in the attainment of the environmental criteria and to establish minimum performance of a quality product.

3.1 Blister Resistance. The exterior wood stain shall be resistant to moisture blistering when tested in accordance with ASTM D 4585 and ASTM D 714 for 24 hours at 100 °F.

Comment:

I believe this section may require some clarification. ASTM D 4585 provides experimental details, while ASTM D 714 provides a rating system for blistering. The two ASTM standards may need to be differentiated in this section. ASTM D 4585 does not specify the type of test panels to be used, but the standard does indicate that metal, plastics, and wood are all appropriate. ASTM D 4585 also indicates that changes in color and overall appearance of the film, in addition to blistering.

Comment:

This is not relevant for penetrating, semi-transparent stains.

Response:

The main purpose of requiring the blister resistance test is to determine the adhesion of the stain product. By definition¹, wood stains penetrate into the wood or form a thin film on the surface of the wood. Blister resistance tests will not produce meaningful data when evaluating penetrating stains and exhibits poor reproducibility when evaluating film forming stains. Furthermore, latex films have a tendency to blush (i.e. develop an opaque haze) when exposed to water. The swelling of trapped hydrophilic material, resulting in pockets with different refractive indexes, has been proposed as a possible model for blushing. Thus,

¹<http://www.fpl.fs.fed.us/documnts/fplgtr/fplgtr113/gloss.pdf>

blush resistance is a test method that can be used to evaluate adhesion of both film-forming and penetrating stains. In order to test for the adhesion of both film forming and penetrating stains, Green Seal will require the blush resistance tests:

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 wood stain shall have a rating of 10 as per ASTM ST 500 after a 24 hour recovery period.

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.

3.2 Adhesion. The exterior wood stain shall have an adhesion of 3B or higher when tested in accordance to ASTM D3359.

Comment:

The ASTM standard mentions that immersion of the test panel is an option. Is immersion a requirement of the GS-47 standard?

Response:

Green Seal has examined and determined that performing adhesion tests will only be a requirement for film forming stains. Green Seal will not require emersion as the only way for adhesion test for film-forming stains. ASTM D3359 provides a list of possible methods for the adhesion test and Green Seal has elected to recommend the use of any of those methods for the test.

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 1/2 to 1 mil thickness.

3.3 Abrasion Resistance. Dried exterior wood stain shall be able to withstand wear from foot traffic and marring from objects rolled or pulled across the surface when tested in accordance with ASTM D 4060.

Comment:

Abrasion resistance is an actual numeric value, expressed either as wear index (I), weight **loss** (L), or wear cycles per mil (W). An appropriate value for one or all of these calculations must be specifically stated.

Comment:

No measurable acceptance criteria are identified. The method cited (ASTM D 4060) is for abrasion resistance by weight-loss. This method exhibits poor reproducibility according to ASTM and is not relevant for evaluation of penetrating stains.

Response:

The main purpose of requiring the abrasion resistance test is to determine the adhesion and long term durability of the stain product especially when applied in areas exposed to high degree of wear and tear from traffic. By definition, stains penetrate into the substrate or form a thin film on the surface of the intended substrate. Abrasion resistance tests will not produce meaningful data when evaluating penetrating stains and exhibits poor reproducibility when evaluating film forming stains. In order to test for the adhesion of both film forming and penetrating stains, Green Seal will require the blush resistance tests:

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 wood stain shall have a rating of 10 as per ASTM ST 500 after a 24 hour recovery period.

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.

3.4 Chemical Resistance. When tested in accordance with ASTM D 1308 using hydrochloric acid, sodium hydroxide, toluene, or ethanol, the exterior wood stain shall demonstrate a rating of 10.

Comment:

The chemical resistance method needs to be clarified as to what the actual substrate the coating would be tested on, how many coats and the percentage of HCL and sodium hydroxide they would be using? 5% solution 10% solution? What's the time interval of exposure?

Comment:

The nature of the test needs to be clarified. The ASTM method specifies a covered spot test, an open spot test, or an immersion test. Additionally, the method indicates that the choice of reagent is dictated by the ultimate application of the coating. Not all reagents are appropriate for all applications. Should some justification be made for choosing a certain reagent?

Comment:

Chemical Resistance: The rating scale is not defined. The proposed requirement for rating of 10 is not realistic if on a scale of 10 and rating means "no effect." We recommend a requirement for a minimum score of 8. The test method within D 1308 is not specified. We recommend the covered spot test, one- hour exposure and one-hour recovery. Also, hydrochloric acid, sodium hydroxide and toluene represent extreme, unrealistic exposures. The reagents selected should reflect real world exposures experienced on a residential deck.

Response:

The covered spot test, one- hour exposure and one-hour recovery are recommended for the chemical test in this standard. Green Seal acknowledges the fact that not all reagents are appropriate for all applications; the listed chemicals may not representative of typical, interior exposures. ASTM D1308 provides a list of possible chemicals for the chemical resistance test and Green Seal has elected to recommend the use of any of those chemicals for the test. However, if another type of reagent is used based on the application of the coating a justification should be provided accompanied by proper documentation and will be subject to Green Seal approval. Green Seal also agrees with the comment that the proposed requirement for rating of 10 is unrealistic if on a scale of 10 (rating means no effect) and has given an allowance to this test to require a minimum score of 8.

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.

Interior Wood Stains

3.5 Pencil Hardness. When prepared and tested according to ASTM D 3363 – 92a, the interior wood stain shall have a pencil hardness of 3H or greater.

Comment:

Most stains for interior wood finishes are designed to have protective clear coats. The clear coat has a need for hardness testing but the stain has no such need at all.

Comment: Film thickness must be specified

Response:

Blush resistance will replace pencil hardness because by definition, an interior stain or dye (normal or gel stain) is supposed to penetrate into the intended substrate. Pencil hardness tests will not produce meaningful data when evaluating penetrating. Blush resistance is a test method that can be used to evaluate adhesion of both film-forming and penetrating stains. The blush resistance test must be done on a 1 mil thick dry film. Green Seal will require the blush resistance test as below:

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 wood stain shall have a rating of 10 as per ASTM ST 500 after a 24 hour recovery period.

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.

3.6 Blister Resistance. The interior wood stain shall be resistant to moisture blistering when tested in accordance with ASTM D 4585 and ASTM D 714 for 24 hours at 100 °F

Comment:

I believe this section may require some clarification. ASTM D 4585 provides experimental details, while ASTM D 714 provides a rating system for blistering. The two ASTM standards may need to be differentiated in this section. ASTM D 4585 does not specify the type of test panels to be used, but the standard does indicate that metal, plastics, and wood are all appropriate. ASTM D 4585 also indicates that changes in color and overall appearance of the film, in addition to blistering.

Comment:

Not relevant for interior stains, which are penetrating, semi-transparent coatings that do not form surface films, and are not exposed to immersion in water or condensing moisture.

Response:

Green Seal believes that interior stains, which are penetrating stains, are not exposed to immersion in water or condensing moisture. Also blister resistance for penetrating stains will not produce meaningful data for evaluation. For this reason Green Seal not require blister resist stance test for interior wood stains. Green Seal will require a blush resistance test to establish the durability of the interior wood stain.

Blush resistance. When prepared and tested on a 1 mil thick dry film according to ASTM D 1735 for 2 hours, the penetrating wood stain shall have a rating of 10 as per ASTM ST 500 after a 24 hour recovery period.

Exterior Wood Finishes

3.7 Pencil Hardness. When prepared and tested on a ½ to 1 mil thick dry film according to ASTM D 3363 – 92a, the interior wood finish shall have a pencil hardness of 5H or greater.

Comment:

The recommend minimum is 2H. Pencil hardness is not relevant for penetrating coatings such as waterproofing sealers.

Comment:

5H is potentially too hard for some exterior coatings to be able to perform well. This needs to be 2H or greater

Response:

Green Seal acknowledges that setting the requirements for pencil hardness to 5H may be too stringent for an exterior wood finish. Although a hard, tough coating may seem to be more desirable, wood is a dimensionally unstable substrate. Hard coatings will invariably crack on wood substrates; a tough but flexible coating is more desirable in this instance. Green Seal has therefore changed the pencil hardness requirement to 2H or greater

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.

3.8 Dry Time. When tested according to ASTM D 1640 the exterior wood finish shall have a maximum dry- time of 4 hrs.

Comment:

The type of dry time not specified. We recommend dry-to-touch. Dry time is not relevant for penetrating coatings such as waterproofing sealers.

Response:

Green Seal agrees with your comments and has made the necessary corrections. Green Seal will not require dry-time test for waterproofing sealers.

Dry Time. When tested according to ASTM D 1640 the exterior wood finish shall have a maximum dry-to-touch time of 4 hrs.

3.9 Adhesion. The exterior wood finish shall have an adhesion of 4B or higher after 7 days cure time when tested in accordance to ASTM D3359 on a dried film of 1 mil thickness.

Comment:

We recommend 3B or higher after 7 days cure time. Adhesion is not relevant for penetrating coatings such as waterproofing sealers.

Response:

In development of a leadership standard, Green Seal desires to set criteria that reward those manufacturers which go above the minimum statutory and regulatory requirements. Green Seal believes setting the requirements for adhesion to 3B does not suit this purpose and has elected not to change the requirement. Green Seal will not require adhesion as a test for waterproofing sealers.

3.10 Chemical Resistance. When tested in accordance with ASTM D 1308 using hydrochloric acid, simple green cleaner, sodium hydroxide, toluene, or ethanol, the exterior wood finish shall demonstrate a rating of 10.

Comment:

The rating scale is not defined. The proposed requirement for rating of 10 is not realistic if on a scale of 10 and rating means “no effect.” We recommend a requirement for minimum score of 8. The test method within D 1308 is not specified. We recommend the covered spot test, one- hour exposure and one-hour recovery. Hydrochloric acid, sodium hydroxide and toluene represent extreme, unrealistic exposures. The reagents selected should reflect real world exposures experienced on outdoor furniture in a residential setting. Chemical resistance is not relevant for penetrating coatings such as waterproofing sealers.

Response:

Green Seal has examined and determined that penetrating stains such as those used for kitchen cabinets are periodically exposed to chemicals (such as soap during washing), chemical resistance at these instances for example is important as it determines the ability of the stain to withstand the exposure to soap. However, Green Seal also agrees with the comment that the proposed requirement for rating of 10 is unrealistic if on a scale of 10 (rating means no effect) and has given an allowance to this test to require a minimum score of 8. The covered spot test, one- hour exposure and one-hour recovery are recommended for the chemical test in this standard. Green Seal acknowledges the fact that not all reagents are appropriate for all applications; the listed chemicals may not be representative of typical, interior exposures. ASTM D1308 provides a list of possible chemicals for the chemical resistance test and Green Seal has elected to recommend the use of any of those chemicals for the test. However, if another type of reagent is used based on the application of the coating a justification should be provided accompanied by proper documentation and will be subject to Green Seal approval. Green Seal will not require chemical resistance test for waterproofing sealers.

Chemical Resistance. When tested in accordance with ASTM D 1308 using the covered spot test for one hour exposure over the intended substrate, the exterior wood finish shall demonstrate a rating of 8 after a one hour recovery period.

Interior Wood Finishes

3.11 Blister Resistance. The interior wood finish shall have a rating of 10 as per ASTM D 714 when tested in accordance with ASTM D 4585 for 24 hours at 100 °F

Comment:

This is not relevant for interior wood finishes, which are not exposed to immersion in water or condensing moisture.

Response:

Green Seal agrees with the comment, interior wood finishes are rarely exposed to immersion in water or condensing moisture. Green Seal has therefore decided to remove blister resistance from the list of requirements for interior wood stains in the current GS-47 Stains and Finishes Standard.

Clear Metal Lacquers

3.12 Adhesion. The exterior clear metal lacquer shall have an adhesion of 4B or higher when tested in accordance to ASTM D3359.

Comment:

Film thickness must be specified.

Response:

Green Seal agrees with the comment and has modified the requirement accordingly.

Adhesion. The exterior clear metal lacquer shall have an adhesion of 4B or higher when tested in accordance to ASTM D3359 on a dried film of 1/3 to 1 mil thickness.

3.13 Surface Hardness. The exterior clear metal lacquer shall have a minimum surface hardness of 3H or higher (7.1.1) when tested in accordance to ASTM D3363.

Comment:

Film thickness must be specified.

Response:

Green Seal agrees with the comment and has modified the requirement accordingly:

Surface Hardness. The exterior clear metal lacquer shall have a minimum surface hardness of 3H or higher (7.1.1) when tested in accordance to ASTM D3363 on a test on a dried film of 1/3 to 1 mil thickness.

3.14 Moisture Resistance. The exterior clear metal lacquer shall have a moisture resistance of a minimum of 100 hours when tested according to ASTM D2247.

Comment:

Exposure periods in multiples of 24 hours are recommended. For instance, 5 days = 120 hours; 100 hours = 4.17 days

Response:

Green Seal agrees with the comment and has modified the requirement accordingly:

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.

3.15 Salt Spray Resistance. The exterior clear metal lacquer shall have a minimum salt spray resistance of 24 hours when tested in accordance to ASTM B117.

Comment:

Exposure periods in multiples of 24 hours are recommended. For instance, 5 days = 120 hours; 100 hours = 4.17 days.

Response:

Green Seal agrees with the comment and has modified the requirement accordingly:

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.

3.16 Wear Resistance. The interior clear metal lacquer shall have a wear resistance of 8 liters or higher when tested in accordance to ASTM D968.

Comment:

Coating thickness and application method(s) should be specified. ASTM D 968 mentions that coating should be applied in accordance with ASTM D 823, unless other specifications are made. Additionally, the thickness of the dry coatings should be measured in accordance with ASTM D 1005, D 1186, or D 1400.

ASTM D 968 specifies two different abrasives -- natural silica or silicon carbide. Water is not mentioned in ASTM D 968, so an explanation of modifications to the method may be required.

Response:

Green Seal agrees with the comment and has modified the requirement accordingly:

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

3.17 Reversibility. The interior clear metal lacquer shall be able to be removed by nothing stronger than Acetone when tested according to ASTM D-4752-87 Max 20 double rubs for complete removal.

Comment:

As this ASTM method is intended to evaluate the resistance of inorganic, zinc-rich primers to methyl ethyl ketone (MEK), I'm not certain if this method is appropriate for the intended measurement. If this method is used, however, a film thickness and cure time must be specified.

Response:

Green Seal agrees will keep the test since it ensures that the coatings will not require strong strippers containing caustics or Methylene Chloride to remove them during subsequent refinishing processes. As a result, a film thickness and time will be added.

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.

3.18 UV Resistance. The exterior clear metal lacquer shall have a UV resistance of a minimum of 144 hours when tested with ASTM G154.

Comment:

Test specimen must be prepared and exposed in accordance with ASTM G 151. This standard should be referenced in this section.

Response:

Green Seal agrees with the comment and has modified the requirement accordingly:

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.

4.0 ENVIRONMENTAL AND HEALTH REQUIREMENTS

4.1 VOC content shall not exceed those listed in table 1, as determined GC/MS method or 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. Additionally, an equivalent test method may be used if accompanied by justification for the method modification and documented in sufficient detail.

VOC limits on stains and finishes (coating type and VOC Content g/L as applied)

Finishes Varnishes	350
Oil finishes	350
Lacquer	550
Clear lacquer brushing	680
Shellacs/pigmented	550
Shellacs/Clear	730
Stains Water-borne stains	250
Solvent-borne stains	250
Semi-transparent stains	250
Opaque stains	250

Comment:

Would like to include a new category - "Conjugated Oil Varnish" - means 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. Supplied as a single component product, conjugated oil varnishes penetrate and seal the wood. Film formation is due to polymerization of the oil. These varnishes may contain small amounts of pigment to control the final gloss or sheen. Limit – 450 g/L

Response:

For consistency with VOC regulations and to avoid confusion, oil varnishes will be evaluated under varnishes category in the present GS-47 standard.

Comment:

What is the rationale for choosing to align with the CARB (California Air Resources Board) standards for VOCs than with the more stringent VOC requirements outlined by the SCAQMD (South Coast air Quality Management District)?

Comment:

There appears to be almost a 10 year difference from the CARB to the SCAQMD standards...would adhere to CARB mean a step backwards?

Comment:

At a minimum, the SCAQMD standards should be used. Really, the proposed standards for 2010, 2011, and 2012 in SCAQMD should be reviewed and initiated. This is a new standard being set and should reflect that fact if it is to be recognized as the new standard to meet!

Response:

While the limits imposed on stains and finishes by SCAQMD generally provide satisfactory results in the climatic conditions found in Southern California, these same products may be challenged in performance in other areas of the country where temperatures and moisture may be more variable. Most of the low VOC

alternatives mandated by SCAQMD will perform adequately in a dry environment as they are “water resistant” but not waterproof. A waterproof product is required in construction and remodeling situations where either cold or inclement weather can occur. It should be noted that SCAQMD acknowledges that some of the limits “may have performance difficulties in extreme temperature and humidity conditions”² but discounts those concerns for their revisions because of Southern California’s unique climatic conditions.

Comment:

Add VOC limit of 250 g/L for Waterproofing Sealers

Add VOC limit of 200 g/L for Sealers

1) Section 4.0 Environmental and Health Requirements needs to allow calculated VOC content based on supplier information as with every regulatory VOC standard.

2) Table 1 should include the Low Solids category. It is available as an alternative to every category in state and South Coast regulations and more accurately reflects the true VOC content of a low solids, waterborne sealer, or stain.

Response:

The Green Seal standard requirements for VOC are GS mass spec based methodology (ASTM D6886), calculated VOC content is more typical of method 24. Green Seal will not proclude a calculation based methodology provided that the calculation is based on boiling point up to 280^oc. Green Seal has added VOC limits for Sealers and waterproof sealers to the GS- 47 Stains and Finishes Standard. Green Seal has determined that due to their molecular contents stains and finishes are already low solid coatings and has elected not to add low solid coating category to the current standard.

Table 1: VOC limits on stains and finishes

Coating type		VOC Content (g/L as applied)
Finishes	Varnishes	350
	Waterborne Finishes	350
	Lacquer	550
	Clear Brushing Lacquer	680
	Shellacs/Pigmented	550
	Shellacs/Clear	730
Stains		250
Sealer		200
Waterproof sealers		250

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

- Carcinogens
- Mutagens

- **Reproductive toxins**
- **Hazardous air pollutants**
- **Ozone depleting compounds**
- **Heavy metals including lead, mercury, cadmium, hexavalent, chromium, and antimony in the elemental form or compounds.**
- **Ethylene glycol**
- **Halogenated solvents**
- **Aromatic solvents**
- **Formaldehyde donors**

Comment:

Ethylene glycol is listed as a Hazardous Air Pollutant by the US EPA. There is no apparent need or reason to single it out with its own prohibition.

EG is commonly used in low-VOC latex paints as a freeze thaw additive. It is usually present in <5% by weight of the total formulation and does not pose a chronic or acute health hazard when used in indoor latex paints according to the EPA's own Captstone report (EPA 600/R-01/093). The long term emissions from latex paints applied to wallboard were below OEHHA's chronic REL of 400 micrograms/m³ in the first 24 hours after application of the paint. RELS are based on human or animal health endpoints and typically include a very significant margin of safety to insure that these levels are safe even for sensitive subpopulations such as children, elderly people, or those with respiratory conditions. So it is unclear why Green Seal wants to prohibit the use of ethylene glycol in indoor paints.

It is Green Seal's prerogative to prohibit HAP-listed compounds like EG, even if they do not pose an indoor health threat as used in paints. Stakeholders and paint manufacturers who want to replace EG in their formulations should be aware that propylene glycol is an odorless substitute for ethylene glycol as a freeze thaw additive, is not a HAP, and is classified as GRAS (generally regarded as safe) as a human and animal food additive by the US Food and Drug Administration.

Response:

Green Seal acknowledges the comment and has removed Ethylene glycol from the specific prohibitions list as it is currently listed in the EPA hazardous pollutant list. Green Seal maintains the prohibition of Ethylene glycol as a hazardous air pollutant because of the dangers that it may pose during the production, manufacture or distribution of the material. Green Seal uses a life cycle approach and aims to eliminate the use of potentially harmful chemicals in the formulation where feasible. Based on background research there are appropriate substitutes to Ethylene glycol that are not considered hazardous air pollutants, such as propylene glycol as mentioned above. The HAP list is used because it identifies chemicals that are known to cause or may reasonably be known to cause harmful effects to humans and the environment. EG and its derivatives are included in this list and are therefore prohibited under the Green Seal standard.

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

- *Carcinogens*

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

Comment:

Are formaldehyde-releasing preservatives still appropriate for use in a Green Seal certified stain or varnish formulation.

Response:

Formaldehyde-releasing preservatives (i.e. formaldehyde donors) are allowed up to 0.01% by weight of the product. Formaldehyde-releasing preservatives release the known carcinogen formaldehyde.

Comment:

The definition of an ingredient, according to the standard, is "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." Vinyl acetate, styrene, ethyl acrylate, and acrylamide are all classified as carcinogens, and are common monomers in many water-soluble latexes. As the standard is currently written, the use of any latex with greater than 100 ppm residual of these monomers would eliminate a formulation from consideration for certification. This may be too stringent a restriction. Ethyl acrylate, for example, has been delisted as an NTP carcinogen.

Response:

While Vinyl acetate, styrene, ethyl acrylate, and acrylamide are common monomers in many water-soluble latexes, the International Agency for Research on Cancer classifies it as Group 2B, "possibly carcinogenic to humans".³ The EPA states, "Human studies on occupational exposure to ethyl acrylate have suggested a relationship between exposure to the chemical(s) and colorectal cancer."^{4 5} They are still considered as carcinogens and their use is prohibited in the current GS-47 Stains and Finishes Standard.

Green Seal Standards are intended to be leadership standard that protect human health and the environment.

Comment:

³<http://monographs.iarc.fr/ENG/Monographs/vol71/mono71-99.pdf>

⁴<http://www.epa.gov/ttn/atw/hlthef/ethylacr.html>

⁵<http://www.epa.gov/oppt/aegl/pubs/rest117.htm>

1)As in the GS-11 standard, exceptions should be made for titanium dioxide and carbon black, and aromatic solvents should be allowed up to 0.5%.

2)An exception should be made for crystalline silica (a trace contaminant in iron oxide pigments made from naturally occurring ore) since it is bound in a polymeric matrix when used in coatings and, as a result, is not respirable.

Response:

Carbon black is listed as IARC 2B, possibly carcinogenic to humans and is also listed as having cancer effects on California's Proposition 65 as carbon black (airborne, unbound particles of respirable size) and carbon black extracts. However, carbon black is also major component of added colorants with no known alternatives with the same performance. While the majority of products are tinted at the point-of-sale, Green Seal did not intend to unfairly restrict the products that are pre-tinted by the manufacturer. Green Seal is adding a de minimus level of 1% by weight of the product to encourage the reduction of carbon black due to the carcinogenic effects. Green Seal will continue to assess the technological innovations and infrastructure of the industry to determine the most appropriate or feasible approach to addressing chemical components of product pre-tinted by the manufacturer as well as additives added at the point-of-sale. In order to be more protective of human health and environmental impacts, Green Seal has included Volatile aromatic compounds in the chemical prohibition list.

IARC lists "crystalline silica (inhaled in the form of quartz or cristobalite from occupational sources)" as *Group 1: Carcinogenic to Humans*. National Toxicology Program (NTP) lists "silica, respirable size" as known to be human carcinogen. While California's Proposition 65 is cited in the standard only in terms of reproductive toxins, it lists "silica, crystalline (airborne particles of respirable size)" as having carcinogenic effects. Each of the listings are specific of the form of crystalline silica that have proven carcinogenic effects—respirable size or inhaled from occupational sources. Based on discussions and additional research, Green Seal believes that "free crystalline silica" should not be added as part of manufacturer formulation. During spray application or sanding of the dry film may exposure the end-user to the respirable form of crystalline silica. The inhalation of crystalline silica is known and proven to be carcinogens by IARC, NTP and California's Proposition 65 and respirable amounts are limited by occupational health regulatory bodies like OSHA, National Institute for Occupational Health and Safety (NIOSH) and the American Conference of Industrial Hygienists (ACGIH). Crystalline silica also appears on a number of states right-to-know acts. However, other forms of crystalline silica, contained as part of naturally occurring raw materials such as titanium dioxide or diatomaceous earth are not in a form that presents a carcinogenic danger and are not intentionally added by the manufacturer. Green Seal recognizes that other forms of crystalline silica, like quartz, are naturally occurring elements and may be a component of other mineral-based raw materials. In the case of titanium

dioxide, crystalline silica is often in its amorphous form. IARC lists amorphous silica separately, classified as *Group 3: Not classifiable as carcinogenic to humans*. Diatomaceous earth as the primary sole source of crystalline silica has been determined to have a safe use level of 6% in interior latex paints by the California Office of Environmental Health Hazard Assessment (OEHHA) for the Safe Use Determination issued Dec 26, 2003.

Free crystalline silica shall not be intentionally added but crystalline silica from naturally occurring ore will be excluded from the chemical prohibition according to how it is listed.

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

- *Alkylphenol ethoxylates*
- *Carcinogens*
- *Mutagens*
- *Reproductive toxins*
- *Hazardous air pollutants*
- *Ozone depleting compounds*
- *Phthalates*
- *2-butoxyethanol*
- *Heavy metals including lead, mercury, cadmium, hexavalent, chromium, and antimony in the elemental form or compounds.*
- *Halogenated solvents*
- *Volatile aromatic 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.⁶ Crystalline silica is prohibited according to the specific form as listed; therefore, crystalline silica as part of naturally occurring mined raw materials is exempted, but free crystalline silica shall not be added as an ingredient.

¹ Titanium Dioxide: EC Number 236-675-5, CAS Number 13463-67-7 Carbon Black: EC Number 215-609-9, CAS Number 1333-86-4

5.0 PACKAGING REQUIREMENTS

5.1 The primary package shall contain the state-of-the-art amount of recovered material and post-consumer content. Where a product's package is below these levels, the manufacturer must demonstrate that efforts have been made to use the maximum available post-consumer material in the package.

Comment:

"State-of-the-art" is too ambiguous. The recovered content should be defined.

Comment:

Section 5.1 specifies recovered content related to the primary package; defined as "Package that is the material physically containing and coming into contact with the product, not including the cap or lid." We support Green Seal's intent to increase use of recycled materials, but have concerns over the subjective nature of the proposed language and potential unintended consequences.

As written, the Section is highly subjective and does not provide adequate direction to Green Seal program members. How is "state-of-the-art amount" defined? The proposed GS-47 standard covers a wide variety of coatings technologies and chemistries. Like USDOT regulations, Green Seal packaging standards should be performance based with overall packaging integrity and suitability the imperative. The overall suitability equation must balance recycled content and integrity for each formulation; this is not necessarily possible with recycled content norm based on overall U.S. industry practice.

We believe that focusing on recycled material strictly in the primary package limits manufacturer's ability to employ other, potentially more effective, source reduction techniques. As an example, bag-in-box packaging systems eliminate up to 95% of the non-renewable plastic used in a blow molded primary container. Flexible film packaging is suitable for low solids stains and film forming coatings of various descriptions.

Because of the precision required to create consistent thin films, flexible packaging is typically manufactured from virgin resins. However, the end result reduces overall raw materials use and embodied energy required for manufacture and transportation. The cardboard outer package, often required for rigid packaging, can utilize high percentages of recovered and post-consumer materials.

We recommend that Section 5.1 be rewritten to allow light-weighted and source reduced packaging with demonstrable non-renewable material savings compared to rigid container counterparts. Packaging evaluation for integrity and source reduction should be geared towards the entire packaging assembly as opposed to the primary package alone.

Response:

Green Seal has examined and determined that the specification of state of the art in the packaging requirements could be further clarified since packaging materials are limited for these products. Green Seal has therefore decided to remove the term state of the art from the requirement. Furthermore, Green Seal has elected to specify recovered material content of 25%. Green Seal believes incorporating recovered material content is feasible based on the current types of packaging. The dominant packaging material--metal paint cans--contain a substantial amount of recovered material content⁷. Plastic containers, which are the growing sector of the packaging market, are either polypropylene (PP) or high density polyethylene (HDPE) and both materials can incorporate a substantial amount of

⁷ *The Inherent Recycled Content of Today's Steel*, Steel Recycling Institute (STI)

recovered material content. Hybrid containers or a mix of metal and plastic containers will be accepted provided that it fulfills the recovered material content. Green Seal also believes that requiring 25% of recovered material content is establishing leadership levels. Incorporating recovered material content is not currently widespread in the industry and some effort or development may be needed to ensure packaging meets the criteria. Green Seal recognizes that some package types are designed for such resource reduction through lightweighting or reuse. Green Seal wishes to encourage the establishment of a take-back program to further divert packaging from the waste stream and includes this allowance in the packaging requirement. Green Seal will continue to examine the existing recycling system and packaging improvements for future revisions.

Recyclable Packaging. 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 Other Restrictions. Phthalates and chlorinated compounds are prohibited from being intentionally introduced; an exception is allowed for packages that would not have added phthalates or chlorinated compounds but for the addition of recovered material.

Comment:

Has a ruling been made on formaldehyde-releasing preservatives? What about Bronopol as a preservative?

Response:

Green Seal currently considers the classification of Bronopol as a formaldehyde releaser. Formaldehyde-releasing preservatives (i.e. formaldehyde donors) are allowed up to 0.01% by weight of the product. Formaldehyde-releasing preservatives release the known carcinogen formaldehyde.

Comment:

VOC content, base ingredient and all product certification levels should be clearly marked on product label.

Response:

A Green Seal certification of a product guarantees adherence to the criteria in the standard and this includes, in the case of GS-47 Stains and Finishes Standard compliance with VOC requirement, amongst others. If more information is needed, all Green Seal standards are available online and they explicitly state which requirements must be met for certification. Moreover, most companies that pursue Green Seal certification will likely promote the low VOC content of their products on their packaging; however this is not a requirement in the Green Seal GS-47 standard. If any claims are made about the voc content, they will be verified by Green Seal Certification.

Comment:

Phthalates should be defined as: "Phthalates means di-(2-ethylhexyl) phthalate (DEHP), dibutyl phthalate (DBP), benzyl butyl phthalate (BBP), diisonoyl phthalate (DINP), diisodecyl phthalate (DIDP), or di-n-octyl phthalate (DnOP)." These are the phthalates that have been identified as harmful by the National Toxicology Program.

Response:

A number of phthalates are prohibited due to their reproductive toxicity (dibutyl phthalate, diethylhexyl phthalate, etc). Others have demonstrated hormone disrupting potential, such as with in vitro estrogen receptor binding activity (diethyl phthalate). While not all phthalates have the same health concerns, there are alternatives available as a result, the class of chemicals known as phthalates will continue to be prohibited.

Appendix

Table 2: Product categories included in the scope of GS-47 Stains and Finishes Standard

Product category	Types
Finishes	Clear Brushing Lacquer
	Lacquer
	Varnishes
	Shellacs/Pigmented
	Shellacs/Clear
Stains	Film forming
	Penetrating
Sealers	Including water proofing sealers