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

BACKGROUND DOCUMENT

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THE MARK OF ENVIRONMENTAL RESPONSIBILITY

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List of Acronyms

ASTM. American Society for Testing and Materials

CFR. Code of Federal Regulations

CAAA. Clean Air Act Amendments

CARB. California Air Resources Board

CCPG. Coatings and Consumer Products Group

CTG. Control Technique Guidelines

EPA. United States Environmental Protection Agency

FR. Federal Registry

GHS. Globally Harmonized System of Classification and Labeling of Chemicals

GC. Gas chromatography

HAPS. Hazardous Air Pollutants

IARC. International Agency for Research on Cancer

IRIS. Integrated Risk Information System

MS. Mass spectrometer

NESHAPS. National Emission Standards for Hazardous Air Pollutants

NTP. National Toxicology Program

OSHA. Occupational Safety and Health Administration

MACT. Maximum Achievable Control Technology

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SCOPE

This standard is being developed to help consumers identify and choose environmentally preferable stains and finishes. This includes stains and finishes that either penetrate into the substrate or form a thin layer on the substrate for decorating or protecting purposes, where the substrate includes wood and metal surfaces. The scope of the proposed GS-47 standard includes 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 ferrous and non ferrous metal. Floor finishes or polishes, defined 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 are addressed in the Green Seal GS-40 Industrial and Institutional Floor-care products, thus are excluded from the GS-47 scope. In addition, architectural coatings including primers and undercoats, interior and exterior topcoats, floor paints and anti-corrosive and reflective coatings, are addressed under the Green Seal GS-11 Paints and Coatings standard, thus are excluded from the GS-47 scope. Also excluded from the GS-47 scope are reconsolidated and reprocessed latex paint are addressed under the Green Seal GS-43 Recycled Content Latex Paint standard.

PRODUCT PERFORMANCE REQUIREMENTS

Product effectiveness is an important component of the marketability of the product and is an essential requirement for ecolabel programs, such as Green Seal's. Currently, there are numerous standardized methods, such as ASTM or ISO methods used to evaluate the performance effectiveness of the products in this standard. However for the purpose of this standard, key performance criteria which affect application and drying of stains and finishes were selected. The selected performance criteria are relevant to both wood and metal coatings but their selection and application depend on the coating property desired for the work at hand. Selected performance criteria include:

i. *Abrasion Resistance*. It is important that the stains and finishes have an adequate abrasion resistance, since such ability helps to maintain the material's original appearance and structure. Abrasion resistance is a measure of the ability of a dried film to withstand wear from foot traffic and marring from objects rolled or pulled across the surface. Abrasion resistance will be determined in accordance with ASTM Test Methods D 968 or D 4060.

ii. *Adhesion*. For coatings to perform satisfactorily, they must adhere to the substrates on which they are applied. Adhesion, the ability of a film to resist

removal from the substrate, is an important property of a coating. Adhesion will be determined in accordance with ASTM Test Methods D 2197, D 3359, or both. ASTM scrub tests may also be adapted to test for adhesion performance.

iii. *Blister Resistance.* Blister resistance is the ability of a dry film on wood to resist the formation of blisters caused by water from the wood substrate. In practice, water can come from either the interior of a structure or from structural defects that permit entry of exterior water behind the wood. Blister resistance can be qualitatively evaluated in a laboratory test. In this standard, resistance to moisture will be determined in accordance with ASTM Test Methods D 4585 and D 714. The uncoated side of the wood should be exposed to the condensing water.

iv. *Drying Properties*. The drying time of a coating is important in determining when a freshly stained surface may be put back in use or re-coated. Slow drying may result in dirt or insect pickup resulting in a poor appearance or, rain or dew may cause a non-uniform appearance. The drying time of a coating is determined by its composition and by atmospheric conditions during drying. Also, some coating formulations dry more slowly with aging. Appropriate drying times will be determined in accordance with ASTM Test Method D 1640.

v. *Pencil Hardness.* Looking at the pencil hardness ratings of different coatings is one criterion to help a woodworker decide which one to select for a particular job as it provides a measure of film properties such as mechanical hardness. The test uses special pencils with different degrees of hardness to scratch the coating, determining its hardness. In this standard, resistance to pencil hardness will be determined in accordance with ASTM Test Method D 3363 – 92a.

vi. *Salt Spray Test*. It is important that the stains and finishes provide corrosion resistance to metallic parts. Since coatings can provide a high corrosion resistance through the intended life of the part in use, it is necessary to check corrosion resistance by other means. A salt spray test is an accelerated corrosion test that produces a corrosive attack to the coated sample in order to predict its suitability as a protective finish. Resistance to corrosion will be determined in accordance to ASTM Test Method B 117.

ENVIRONMENTAL AND HEALTH REQUIREMENTS

VOLATILE ORGANIC COMPOUND CONTENT

Due to their solvent content, stains and finishes are a major contributor to indoor air pollution affecting human health by releasing fumes into the air[1]. Poor indoor air quality as a result of VOCs is also one of the biggest contributors to asthma and other respiratory ailments in school aged children. Setting appropriate levels of VOC content is essential to

[1]http://www.ecoscorporation.com/library/indoor_air_quality_issues_paper_Final.pdf

minimizing the potential health effects of products like stains and finishes on workers, children, and otherwise vulnerable or sensitive populations. An article by Mendell (2007) reviewed 21 published epidemiologic studies on associations between indoor residential chemicals and respiratory health and/or allergy in children. Specifically, Mendell found associations between formaldehyde and phthalates and asthma, as well as suggestive evidence for aromatics, aliphatics, limonene, tetrachloroethylene, trichloroethylene and either asthma-related effects or allergy/atopy indicators or both[2].

Consumer and commercial use of stains and finishes may result in the emission of VOCs from both solvent-based and, and to a lesser extent, water-based coatings. These compounds are released into the atmosphere by evaporation during the drying process of a coating. In the atmosphere, photochemical reactions[3] between VOCs and other common airborne pollutants, such as nitrogen oxide (NO_X), result in the formation of ground-level ozone (O_3)—a respiratory irritant and a component of smog. Smog is a noxious mixture of air pollutants, including ground-level ozone and particulate matter (PM), which can often be seen as a haze in the air, especially over urban centers.

Scientific evidence[4] indicates that ground-level ozone can have a detrimental impact on the environment. This impact can lead to reductions in agricultural crop and commercial forest yields, reduced growth and survivability of tree seedlings, and increased plant susceptibility to disease, pests, and other environmental stresses (e.g. harsh weather). Air pollution has also been shown to have a significant adverse impact on human health, including premature death, emergency room visits, and hospital admission. Studies[5, 6] indicate that air pollution is also associated with a long-term increased risk of lung cancer and heart disease.

VOC levels in the proposed standard are unique to product type: varnishes, oil finishes, lacquer, clear lacquer brushing, shellacs, waterborne stains, solvent borne stains, semitransparent stains and opaque stains. There are existing VOC limits in the United States; these include those regulated by the California Air Resources Board (CARB), the California South Coast Air Quality District (SCAQD) and the United States Environmental Protection Agency (EPA). These limits are summarized in Table 1 below.

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[2]Mendell, M.J. 2007. "Indoor residential chemical emissions as risk factors for respiratory and allergic effects in children: a review." Indoor Air.17:259-277.

[3]chemical reaction by sunlight

[4]U.S. Environmental Protection Agency, Fact Sheet, EPA's Revised Ozone Standard, July 17, 1997 (www.epa.gov/ttn/oarpg/naaqsfin/o3fact.html)

[5]Krewski, D.; Burnett, R.; Jerrett, M.; Pope, C. A.; Rainham, D.; Calle, E.; Thurston, G., and Thun, M. "Mortality and long-term exposure to ambient air pollution: ongoing analyses based on the American Cancer Society cohort." *J Toxicol Environ Health A*. 2005 Jul 9-2005 Jul 23; 68(13-14): 1093-109

[6]Krewski, D.; Burnett, R. T.; Goldberg, M.; Hoover, K.; Siemiatycki, J.; Abrahamowicz, M.; Villeneuve, P. J., and White, W. "Reanalysis of the Harvard Six Cities Study, part II: sensitivity analysis." *Inhal Toxicol*. 2005 Jun-2005 Jul 31; 17(7-8): 343-53

Table 1

Product	VOC Content (g/L as applied)			
	Green Seal	CARB	SCAQMD	EPA
Varnishes	350	350	275	450
Lacquers	550	550	275	680
Clear brushing lacquers	680	680	275	
Shellac clear	730	730	730	730
Shellac pigmented	550	550	550	550
Stains	250	250	100	550

The proposed VOC concentration limits in this standard have been developed to align with requirements of CARB[7] rather than lower limits mandated by SCAQMD Rule 1113[8]. While the limits imposed on stains and finishes by Rule 1113 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 SCAQD 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 SCAQD acknowledges that some of the limits in Rule 1113 "may have performance difficulties in extreme temperature and humidity conditions"[9] but discounts those concerns for their revisions because of Southern California's unique climatic conditions.

In 1998, the EPA promulgated the *National Volatile Organic Compound Emission Standards for Architectural Coatings* (the National Rule)[10]. The National Rule specifies VOC concentration limits for 61 architectural coating categories, including stains and finishes. However recent advances in technology now make it feasible to set lower VOC concentration limits in 26 categories, including stains and finishes, while maintaining levels of performance and durability similar to those of coatings with higher VOC concentration. For these same reasons Green Seal elected to adopt the VOC limit for stains and finishes as mandated by the CARB.

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[7]California Air Resources Board, Suggested Control Measure for Architectural Coatings, 2007 Draft Proposed SCM Language. http://www.arb.ca.gov/coatings/arch/Draft_Proposed_SCM_Language.pdf Accessed August 9, 2007.

[8]SCAQMD Rule 1113 - Architectural Coatings (Amended July 9, 2004); http://www.aqmd.gov/rules/reg/reg11/r1113.pdf

[9]

[10]For further information, visit the Web site at http://ecfr.gpoaccess.gov/cgi/t/text/textidx?c=ecfr&sid=6a92a7c05f08fae1c5d0fda4bb8e3570&rgn=div5&view=text&node=40:5.0.1.1.7&idno=40

COMPOUND PROHIBITIONS

The proposed standard cites established lists of harmful chemicals including carcinogens, mutagens, reproductive toxins, hazardous air pollutants, and ozone depleting compounds. In addition, the following compounds are prohibited, ethylene glycol, halogenated solvents, aromatic solvents, and heavy metals including lead, mercury, cadmium, hexavalent chromium, and antimony in the elemental form or compounds. In order to protect human health and the environment, Green Seal believes it is important to prohibit chemicals in stains and finishes formulations that have been identified by recognized organizations for having deleterious effects. The utilization of established lists is a more comprehensive approach and avoids the "laundry-list" of chemicals that is both cumbersome and allows formulations to contain other potentially more harmful chemicals. This approach also discourages the proliferation of established harmful compounds in the overall industry and encourages innovation towards alternative chemicals. The citing of the additional compounds was done since the lists do not address the health concerns associated with these compounds, and there is not a commonly accepted test for such concerns (ex. endocrine disruption).

PACKAGING REQUIREMENTS

Reducing the total packaging and material from virgin sources is an effective means to reduce the life cycle impact of a package, especially when it is not recyclable. While, promoting recyclable packaging is important, Green Seal is cognizant of the potential ramifications of improper disposal of product. Therefore proper disposal of leftover product is addressed at the Labeling Section of the proposed Standard. Based on research, Green Seal has determined that packaging for stains and finishes are either made of steel, polypropylene, and in some instances high density polyethylene (HDPE). Steel can be accepted by both curbside and drop off collection sites in many communities. Plastic containers on the other hand present a problem in recycling facilities as many HDPE containers contain a metal ring, which in addition to left over residue, prevent plastic from being recycled in the majority of communities. Green Seal wants to encourage the use of materials that can be recycled, but also recognizes the need for an allowance for effective recycling stream to be established for certain types of materials. As a result, there currently is not recyclable-package requirement and rather, the proposed standard specifies inclusion of state of the art amounts of recovered and post consumer content in the product packaging. State of the art is defined as what is technologically feasible at the time and is intended to allow for innovation. As there are different types of materials that may be used as packaging, it is specified to allow for technological innovations throughout the standard. Manufacturers can demonstrate leadership levels by continuing to increase recovered material content as technology advances.

The proposed standard restricts the intentional introduction of heavy metals including lead, mercury, cadmium and hexavalent chromium into the product packaging. This is consistent with the Council of Northeast Governments recommended regulatory language. The proposed standard also prohibits phthalates and chlorinated compounds from being intentionally introduced into the product packaging because they are known

endocrine disruptors. This addresses issues of plastic additives used to soften polyvinyl chloride and the use of polyvinyl chloride (or PVC, plastic resin #3) which although currently are not common packaging materials in the industry, Green Seal believes that it is important to be comprehensive in standard – development and disallow any known alternatives that have known human health and environmental impacts. Green Seal believes that the specification is necessary to address alternative materials as well as improvements and growth in recycled content material technology.