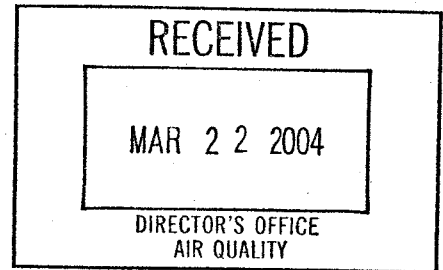


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March 16, 2004

Joyce E. Epps  
Director, Bureau of Air Quality  
Pennsylvania Department of Environmental Protection  
12th Floor, Rachel Carson State Office Building  
P.O. Box 8468  
Harrisburg, PA 17105-8468



Re: Architectural and Industrial Maintenance Coatings Rule - Variance Application

Dear Ms. Epps:

Recently Sherwin-Williams filed an application for a variance under the Department's Architectural and Industrial Maintenance (AIM) Rule for certain interior stains. Terry Black and Kristen Campfield subsequently called me and asked for additional clarifications in the application. On behalf of Sherwin-Williams I am submitting the enclosed revised variance application, which is intended to satisfy the information needs identified by Mr. Black and Ms. Campfield.

One of the issues which they raised with me is not directly responded to in the revised application, however, so I will offer an explanation herein. They questioned why there were differing VOC contents listed for stains manufactured by Minwax and Sherwin-Williams which had similar names, such as the Golden Oak stain in the Sherwin-Williams' WOOD CLASSICS® line and the Golden Oak stain in the Minwax line. The simple fact is that VOC content of various formulations of oil-based stains will vary from color to color within a product line and from product line to product line within the Sherwin-Williams' family of product lines. A stain listed by a particular color name in one product line is not necessarily interchangeable with a stain by the same name in another product line.

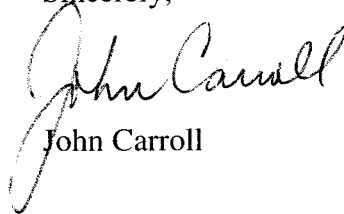
Furthermore, because the AIM rule does not address the issue of minimizing VOC's, but merely requires a wood stain category to meet limits significantly lower than can presently or foreseeably be achieved with oil-based stains without introducing unacceptable side effects, there is no current incentive to minimize VOC content in oil-based stains under the rule. Sherwin-Williams' research efforts, as explained in the variance application, are thus directed at finding compliant stains, not in developing additional non-compliant oil-based stains with lower

Joyce E. Epps  
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VOC contents. If, however, the Department were willing to amend the AIM rule to exempt the interior stain category from the rule, Sherwin-Williams would be willing to discuss a plan for minimizing VOC content of oil-based stains with an appropriate research effort devoted thereto.

Should you or your staff have additional questions or concerns with the revised variance application, please advise. Sherwin-Williams would appreciate final action on the variance request at your earliest convenience.

Sincerely,



John Carroll

Enclosures

Sherwin Williams Wood Care Division hereby files this amended variance request pursuant to 25 Pa. Code 130.306 for the interior wiping stains listed in Exhibit A.

**(1) The specific grounds upon which the variance is sought.**

The products listed in Exhibit A do not meet the VOC content limits of Section 130.303, Table 1 of the AIM rule and cannot be formulated to meet those VOC limits without substantially increasing toxicity or fire hazard, or jeopardizing the performance criteria which make these products feasible for application to large surfaces (e.g., floors, paneling, etc.) or fine wood surfaces that will not be subsequently top coated with a clear finish. Unlike waterborne stains, these products do not cause grain raising and do not cause lapping during application on large surfaces. Lapping is caused when the coating penetrates the wood and dries too quickly, leaving a tacky solid or semi-solid residue that cannot be blended during application of the coating on adjoining substrate. Grain raising causes objectionable surface roughness that results from the swelling and standing up of short, broken fibers of wood when exposed to water.

The problems created by lapping and grain raising are related in terms of root cause, and stem from the hydrophilic (i.e., water-loving) nature of wood. The dried wood used to create architectural surfaces is composed primarily of cellulose and hemicellulose, both of which are highly hydrophilic (by way of common example, most sponges are cellulosic in composition). In nature, however, up to 70% of a tree's mass is water, which is why the wood must be dried after the tree is harvested and cut into useful lumber. The wood never "forgets" that it was once primarily water, which is why it behaves so differently and undesirably when a waterborne stain is applied.

How do these characteristics of wood lead to the unacceptable performance of waterborne stains in most interior applications? There are three primary reasons:

1. Water evaporates much more quickly than mineral spirits, the solvent that is most commonly (almost exclusively) used to make interior solvent-based stains and that, importantly for purposes of air quality, has much lower Maximum

Incremental Reactivity (potential to cause ozone formation) than other solvents used in architectural coatings. Evaporation rate, all other things being equal, is a function of vapor pressure, and the vapor pressure of water is approximately seven times that of mineral spirits. Because of its high vapor pressure, water evaporates from the freshly applied wet stain very quickly (unless the dew point of the surrounding air is unusually high), leaving very little wet edge time, which is the length of time a coating remains wet enough to allow for brushing-in (in the case of wiping stains, wiping-in) at the laps. The result is lap marks that cannot be repaired without sanding back to bare wood and applying a stain with acceptable wet edge time. Many manufacturers of waterborne stains advise against treating large areas due to the lapping problem. Some suggest applying the stains to areas no larger than 6' x 4' in order to maintain the wet edge. Such small area application is impractical on large surfaces and could not even be accomplished with more labor-intensive effort (see discussion below).

2. Due to its highly hydrophilic nature, wood absorbs a significant amount of the water from the freshly applied wet stain and it does so very quickly. This exacerbates the wet edge issue described above. It also means that the stain must be quickly wiped off and blended so that uneven color does not occur (the intensity of color is increased by allowing wet stain to remain on the wood for a longer period of time prior to wiping the area dry).
3. With the exception of a few exotic, oily wood species, most wood shrinks when it dries and swells when it gets wet. When a waterborne stain is initially applied and as the wood grain consequently swells, pigment gets locked in the spaces and pores and, as a result, cannot be dislodged during any attempt to evenly distribute colorant to eliminate a lap mark.

**(2) The proposed date by which compliance with § 130.303(a) will be achieved.**

Sherwin Williams is engaged in extensive ongoing research efforts to find suitable substitute stain formulations which have the performance characteristics of the wiping stains for which this variance is sought. Those efforts will continue, and Sherwin

Williams will report the results of its research efforts to the Department annually. Since no one can predict the future or foresee all potential complications and their consequences, it is not known at this time when a suitable formulation will be identified, and thus it is not possible to propose a definitive compliance date, although our research and development efforts are directed towards a targeted January 1, 2010, compliance goal.

**(3) A compliance report detailing the methods by which compliance will be achieved.**

Sherwin-Williams markets both waterborne and solvent-based interior wiping stains. Research to date has demonstrated that waterborne stains, while suitable for many applications, cannot achieve the handling, appearance and performance criteria for the applications in question. Research is currently focused on alternative formulations, including an assessment of exempt solvents and high solids formulations. The unwanted side effects of some of these formulations include strong odors, increased toxicity, and excessive flammability risks. Research will continue in an effort to find suitable alternate formulations that have the required attributes and minimal unacceptable side effects.

To a large extent, this research involves trial and error methods in which coatings with various mixtures of compliant VOC content are formulated and tested for performance characteristics. Although it is possible to improve VOC content within the non-compliant range, this particular research project is directed at finding interior wiping stains which are fully compliant with the AIM VOC content limits and which have minimal adverse impacts and maximum performance criteria. Details of this research effort are considered business confidential information due to the significant competitive advantage which will be enjoyed by those manufacturers which are able to develop a compliant interior wiping stain with acceptable application, handling, appearance and performance characteristics.

**(4) It is technologically infeasible for these products to comply with the requirements of § 130.303(a).**

Technological infeasibility has two components. The first is the technical feasibility of meeting performance criteria for the product, i.e., 1) a product which can be applied over a large surface with a lag time of up to ten minutes between application on adjacent substrate without causing lapping due to drying of the first coat, which inhibits non-overlapping blending of the product, and 2) a product that does not cause grain raising on surfaces that will not be top coated with a clear finish that builds a surface film. The second technological issue is in formulation of the product in finding a formula that meets the performance criteria without undesirable side effects such as strong odor, flammability, toxicity, ease of handling, etc.

While there are compliant products that perform well when applied to small areas where grain raising is not an issue and the dry time is not critical to material performance, it is currently not technically feasible to manufacture an interior wiping stain with an acceptable level of undesirable side effects. It has been suggested that the problem of lapping might be addressed with additional labor in applying the stains so that a wet edge is maintained over a large surface. Because the creation of uniform shade in application of a stain requires covering and wiping as large an area as possible in order to avoid a checkerboard appearance, it is generally infeasible to have multiple workers applying the stain. Even with a ten-minute wet edge time, it is doubtful that even multi-staff applicators could effectively and evenly stain large surfaces. Under very dry ambient conditions compliant waterborne wiping stains can be absorbed in less than five minutes, making it nearly impossible to coat large areas, even if labor costs were not a factor. Note that the recommendation of some manufacturers to coat only 4' x 6' sections leaves ten feet of wet edge per application and creates a wet edge in two separate directions. A 30' x 30' floor would have 35 such panels, or 350' of wet edge. Because the wet edge is in two directions and the waterborne stain dries so quickly, a minimum of two persons would be required, thus doubling labor cost. Additionally, any delay in blending any portion of that 350' will leave a lap mark with waterborne stains, so even multiple applicators must work in close harmony, working from one corner toward the other as each small segment is stained, wiped and blended with the adjacent

segment. This would be a logistical nightmare, which is why waterborne stains are not used in such large surface applications.

In using oil stains, there is no need to leave a wet edge in two directions, the room can easily be stained by one person in five, six foot applications with a maximum wet edge of 30 feet. Also, the longer wet-edge time of oil stains is not affected by humidity, which has no effect on the evaporation rate of organic solvents. Additionally, the contractor should not be required to hire additional staff based on the nature of the coating being applied on a given job. The labor costs of custom wood finishing are by far the most significant factor in a cost-competitive marketplace.

**(5) The public interest in issuing the variance outweighs the public interest in avoiding increased emissions of air contaminants that would result from issuing the variance.**

Consumers and professional contractors demand quality wood finishes with even color and no lap marks, streaks or grain raising (where grain raising is an issue). Custom finished flooring, paneling and casework is installed only in the finest residences and commercial properties. Contractors who install custom woodwork rely on quality wiping stains to achieve the appearance demands of their customers. Without quality wiping stains there will be some transition to pre-finished wood, which will jeopardize the business of highly-skilled custom-wood contractors. The variance will not result in an increase in emissions, but may result in less decrease in emissions than would be experienced if these products were no longer available. It is estimated that this "lost" decrease will be less than 0.8 tons of VOC emissions per day statewide if the products identified in the appended list are granted a variance. Because penetrating oil stains are sometimes used without a clear finish topcoat, the actual lost decrease in emissions could be lower than that figure due to the differing limits in the regulation between finish coat VOC content (350 g/L for varnish, 680 g/L for brushing lacquer) and stain VOC content (250 g/L).

**(6) The compliance program proposed by Sherwin-Williams can reasonably be implemented and will achieve compliance as expeditiously as possible.**

Sherwin-Williams is devoting a significant portion of its research and development budget in the wood care product line to development of coatings, including wiping stains, which meet VOC content limitations in all its markets. It is not believed that any commitment of additional resources will result in a more expeditious discovery of a wiping stain formulation that meets performance criteria and VOC-limit compliance.

While the research efforts described above are aimed at developing fully compliant coatings, Sherwin-Williams also urges that the Department take into consideration the use of sliding-scale VOC reduction goals that recognize incremental improvements in wood-stain emissions. For example, Sherwin-Williams' Minwax and Duraseal brands market stains with less than 450 g/L VOC if calculated on an actual emissions basis (as opposed to 540 g/L by the regulatory VOC calculation which overstates VOC content because it subtracts the water and exempt compound portions of a coating.) Because such products are more environmentally beneficial than products that contain no water or exempt solvent, the regulatory program should encourage their use in lieu of products that contain no water or exempt solvents. It is believed that such low VOC products are on a continuum of product formulations deserving of further research that holds great promise for resulting in further VOC reductions as coatings science develops in the coming decade.

#### Emissions Reductions with the AIM Rule

Sherwin-Williams incorporates into this variance request the detailed written comments it filed with DEP, IRRC and the EQB in conjunction with the AIM rulemaking. Sherwin-Williams believes that the background documents relied on by the Department to estimate the emissions reductions achievable from implementation of the AIM rule are seriously flawed, and that the Commonwealth will meet or exceed the overall emission reductions goal even with the granting of this variance request for interior wiping stains. Out of the Department's projected 28-ton-per-day reduction in emissions to be achieved by implementation of the rule, this variance request amounts to less than 3% of the reduction. Sherwin-Williams has provided data demonstrating that the actual reductions



to be achieved from implementation of the rule were underestimated by almost 50%. Sherwin-Williams stands ready to assist the Department in making a demonstration of rule effectiveness to EPA which will document the underestimation of the currently projected emissions decreases. This demonstration will more than offset the modest emissions impacts associated with this request for variance.

## Appendix A - PENNSYLVANIA VARIANCE APPLICATION

### Sherwin-Williams Solvent-Based Interior Wood Stains

<u>PRODUCT NAME</u>	<u>VOC CONTENT<sup>1</sup> (g/L)</u>
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**Minwax Wood Finish:**

Natural	544
Golden Oak	541
Provincial	540
Puritan Pine	541
Ipswich Pine	540
Colonial Maple	539
Special Walnut	536
Red Mahogany	529
Early American	540
Cherry	544
Fruitwood	538
Dark Walnut	538
Jacobean	535
Red Oak	533
Golden Pecan	541
Pickled Oak	532
Sedona Red	528
English Chestnut	531

**Minwax Pastels:**

Winter White	537 (442 material)
Summer Straw	539 (448 material)
Pale Gray	535 (441 material)
Slate Blue	533 (444 material)

**Dura Seal Penetrating Finish:**

Natural	435 (348 material)
Nutmeg	531
Chestnut	521
Royal Mahogany	500
Neutral	536
Antique Brown	498
Golden Brown	462
Coffee Brown	492
Medium Brown	472
Ebony	467
Spice Brown	482
Rosewood	485

Sedona Red 534

**Dura Seal Pastels:**

Country White 537 (442 material)  
Stone Gray 535 (441 material)  
Golden Wheat 539 (448 material)

**Dura Seal Fast Dry Wood Stain:**

Antique Brown 639  
Golden Brown 673  
Medium Brown 666  
Spice Brown 677

**Pratt & Lambert® TONETIC\* Interior Wood Stain (Oil):**

Early American Maple 671  
Fruitwood 653  
Light Oak 670  
Walnut 655  
Teak 670  
Neutral (Clear) 612  
White Ash/Pastel Base 577  
Eastern Red Cedar 621  
Pacific Koa 623  
Walnut Grove 611  
Classic Oak 611  
Cherry Bark 586  
Rich Mahogany 592

**Sherwin-Williams® WOOD CLASSICS\* Interior Wood Oil Stain:**

Golden Oak 525  
Fruitwood 525  
Pecan 525  
Charcoal 525  
Classic Cherry 525  
Wild Berry 525  
Natural 525  
Pickled White 525

<sup>1</sup> VOC Regulatory (i.e., less water) except where indicated; “material” = actual VOC