

BOARD MEETING DATE: December 5, 2003

AGENDA NO. 28

PROPSAL: Annual Status Report and Technology Assessments on Rule 1113 – Architectural Coatings

SYNOPSIS: At the December 6, 2002 meeting, the Board approved a resolution directing staff to provide a progress report on achieving the 2006 compliance limits and the rule requirement for a technology assessment of lacquer coatings. This report fulfills that directive and provides staff's recommendation on further addressing the following subjects: (1) meetings with committees; (2) compliance activities associated with implementation; (3) averaging compliance option programs received and reviewed; and (4) additional low- and zero-VOC architectural coating products available. Finally, staff has included a discussion of other technology assessments completed relative to available coatings technologies.

COMMITTEE: Stationary Source, October 24, 2003, Reviewed

RECOMMENDED ACTION:
Receive and file this report.

Barry R. Wallerstein, D.Env.
Executive Officer

EC:LT:LL:DB

PURPOSE

This report serves three main purposes:

- Fourth annual progress report for implementation of Rule 1113– Architectural Coatings.
- Report on progress in producing compliant products with respect to the coating categories subject to the July 1, 2006 limits in the rule.
- Technology assessment report on lacquer coatings as required by Rule 1113.

BACKGROUND

The 2003 AQMP indicates that the contribution of VOC emissions from architectural coatings continues to be one of the most significant non-mobile sources attributable to ozone pollution within the District. Based on the report “1997 Annual Average Emissions by Source Category in the South Coast Air Basin,” more than 50 tons per day of VOCs are from architectural coatings. The District considers VOC reductions from architectural coatings to be a critical component of its attainment plan.

This report is intended to give the Board an overall perspective as to the performance and acceptability of low- and zero- VOC coatings that are in use today across a wide spectrum of coating substrates and environmental conditions. The report also summarizes meetings with stakeholders and reports on progress in implementing a number of rule-related programs.

FIELD ACTIVITIES

This year’s technology assessment focused on visiting close to 40 locations where low- and zero-VOC products were being applied in manufacturing and *insitu* architectural settings. Staff asked applicators to comment on performance, ease of application, dry times, cost and appearance of the coatings. Detailed reports have been prepared and made available to the Rule 1113 advisory committee. They are summarized in the 2003 Annual Report. Staff also viewed many previous applications of the same low- and zero-VOC products from several years ago and heard testimony from individuals on how well the coatings are holding up to daily usage. The coatings observed by staff included applications to floors (both wood and concrete), concrete structures, stains on wood, coatings for use on metal, various architectural coatings for homes, parking structures, and many other substrates.

Rule 1136-Technical Assessment

The results of the technical assessment and the industrial progress reports required under Rule 1136 indicate that the technology exists and is in use today in the form of many resin and solvent systems that have less than 275 g/l of VOCs for application to wood substrates. Many of these coatings fall within the proposed clear wood finishes category under Rule 1113 and indicate the ongoing use and reliability of the lower VOC finishes. The complete technology assessment, issued in June 2003, is available for the Board's review in Appendix D of the Annual Report attached to this letter.

Specific Coating Category Assessments by District Staff

District staff continually evaluates coating products that are commercially available and that meet current and future VOC limits as established in Rule 1113. An analysis of technical data sheets (TDS) and material safety data sheets (MSDS) published by coating manufacturers is one of many methodologies used to complete assessments of available coatings. This list is continually updated as staff reviews additional information on compliant and super compliant architectural coating products that are currently available for the various categories studied.

Lacquers

Contract work completed by AVES in May 1999 to develop and demonstrate super compliant coatings, substantiates staff contentions that replacements for high-VOC clear wood finishes are feasible. Commercially available coating systems (both lacquer and varnish) were tested side-by-side with no-VOC lacquer and varnish topcoat systems for repair and refinishing. This new no-VOC varnish system showed the best overall appearance after repair, but had the highest coating usage because the two-component coating resulted in a limited pot life (period of material-reacting time during which coating can be applied). The new no-VOC lacquer system was the easiest to repair and showed the best gloss after repair. In order to obtain the impartial opinion of experienced painters on the performance of the new coatings, the painters of Commercial Casework, Inc. in Fremont, California conducted a field demonstration of the new coating system as part of this study. The personnel from Commercial Casework were impressed with the new wood coatings due to fast dry time, ease of use, and the safer working environment resulting from the absence of solvents.

District staff's opinion is that the coatings formulated for this study could readily be applied in typical architectural settings. The final report titled, "Development and Demonstration of Zero- and Low-VOC Resin Technology for Advanced Control Measure Development," issued on March 29, 2001, is included in Appendix C of the Annual Report, attached to this letter, for the Board's review.

Past and On-going Coating Studies

In this Annual Report, staff has summarized other studies regarding architectural coatings indicating the availability of compliant coatings in the specific categories studied. These categories included wood coating products, industrial maintenance coatings and other general categories such as nonflats, primers, sealers, undercoaters, floor, rust and waterproofing products. The studies demonstrate that low-and-zero VOC coatings are as good, if not better, than the higher VOC counterparts and meet or exceed expected performance coating characteristics. The data was generated from the following studies: USEPA and Midwest Research Institute Case Studies, National Technical Systems, KTA-Tator, Southern California Alliance of Publicly-Owned Treatment Works (SCAP) and Essential Public Service Agencies.

The Essential Public Service Agencies study is scheduled to be completed in 2005. Results of the completed study will be presented to the industry and the Board upon completion.

ROUTINE ACTIVITIES

Averaging Compliance Option (ACO) Plans

The AQMD, working extensively with members of the architectural coatings industry and other stakeholders developed and incorporated an alternative compliance option into Rule 1113, the Averaging Compliance Option (ACO). The purpose of the ACO is to promote compliance flexibility and allow manufacturers additional time to reformulate certain compliant products of their choice. In the November 8, 1996 amendments to Rule 1113, an ACO was included for the Flats category with subsequent amendments on May 14, 1999 designed to streamline its implementation and add categories to provide additional compliance flexibility with the future limits. Initially, the first year that the ACO was made available, there were three manufacturers that submitted plans for the period of June 30, 2001 to July 01, 2002, all of which elected to average flat coatings. Today, there are eight manufacturers that are utilizing the ACO for averaging a variety of coating categories including flats, nonflats, floor, industrial maintenance, primers, sealers, undercoaters, quick-dry primers, quick-dry sealers, quick-dry undercoaters, quick-dry enamels and rust preventative.

Averaging Compliance Option (ACO) Audits

ACO audits for two of the three manufacturers that originally filed plans were conducted and completed by the District for the period of June 30, 2001 to July 01, 2002. District staff is currently in the process of auditing the final manufacturer that had a plan in place during the original time period. The results of the completed audits indicate that the facilities were able to comply with the averaging compliance option in the rule. District staff is committed to initiating

audits for the eight manufacturers utilizing the ACO for the most recent period, beginning January 1, 2003, and ending December 31, 2003 during the first quarter of next year.

Meetings

Since last year's annual report to the Board, the District has continued to have meetings with the Rule 1113 Working Group and Technical Advisory Committee. The following meetings took place during this reporting period:

MEETINGS	DATE(S)
Working Group and TAC Meetings	March 20, May 6 and September 30, 2003
Working Group Meetings	July 16 and August 19, 2003
Public Workshop	September 4, 2003
Public Consultation and TAC Meetings	October 16, 2003

SUMMARY

- Surveys and studies have substantiated that the list of viable compliant and super-compliant coatings continues to grow and share a significantly increasing portion of the architectural coatings market.
- The District's research of technical information (i.e. MSDS, sales data, marketing brochures, etc.) and other sources continues to support staff's position that there are a substantial number of ultra-low VOC products available that meet future proposed limits.
- The compliant coatings are being used and meet or exceed expected performance characteristics for many different substrates in various environmental conditions.

Future Program Activities and Studies

Over the next year, staff will study all coating categories whose limits will have changed with the anticipated December, 2003 amendments to Rule 1113. In addition, the Technical Advisory Committee has asked staff to study several coating categories in more detail to confirm some of the performance conclusions derived from the technology assessments. Working with this committee and other manufacturers, staff has agreed that high-gloss non-flats, clear wood finishes including varnishes and exterior stains applied to horizontal surfaces are good candidates for further study in 2004 and 2005.

In addition to these technology assessments, staff will continue to research the feasibility of further reductions in the VOC content of all architectural coating categories by and through the use of all available resources. Those resources include but are not limited to holding meetings with the Technical Advisory Committee and Working Group members, further evaluation of the 2001 CARB Architectural Coatings Survey, review of results of studies underway by Essential Public Service Agencies on performance of industrial maintenance coatings and continuing field audits and contractor surveys of in-use applications of compliant and super compliant coatings. Additionally, staff will continue to review sources of information on the availability of zero- and low-VOC products as well as working with wood product coating manufacturers to test a variety of coatings for field applications. Staff will also continue to evaluate sales records and field compliance audits of those manufacturers utilizing the averaging compliance option available under the rule.

The next Annual Report will be presented to the Governing Board in December of 2004.

Attachment

- A. Annual Status Report and Technology Assessments on Rule 1113- Architectural Coatings, December 2003

ATTACHMENT A

**ANNUAL STATUS REPORT AND TECHNOLOGY ASSESSMENTS ON RULE
1113-ARCHITECTURAL COATINGS**

December 2003

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

**ANNUAL STATUS REPORT AND TECHNOLOGY ASSESSMENTS
ON RULE 1113 – ARCHITECTURAL COATINGS**

Dated: December 2003

Deputy Executive Officer

Planning, Rule Development, and Area Sources
Elaine Chang, DrPH

Assistant Deputy Executive Officer

Planning, Rule Development, and Area Sources
Laki Tisopulos, Ph.D., P.E.

Planning and Rules Director, Area Sources

Planning, Rule Development, and Area Sources
Lee Lockie

Author:	David De Boer	Senior Staff Specialist
Reviewed by:	Frances Keeler Naveen Berry	Senior Deputy District Counsel Program Supervisor
Contributors	Don Hopps William Milner Dan Russell Eugene Teszler	Air Quality Inspector III Air Quality Specialist Air Quality Specialist Air Quality Specialist

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

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Riverside County Representative

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JAMES W. SILVA
Supervisor, Second District
Orange County Representative

CYNTHIA VERDUGO-PERALTA
Governor's Appointee

EXECUTIVE OFFICER:

BARRY R. WALLERSTEIN, D.Env.

Purpose of this Report

This report serves three main purposes.

- **Fourth annual progress report prepared in accordance with the 1999 Board-approved Workplan for implementation of Rule 1113 – Architectural Coatings.** This workplan was adopted by the Board in May of 1999.
- **Report on industry’s progress producing compliant products with respect to the coating categories subject to the July 1, 2006 limits in the rule.** On December 6, 2002 the Board amended Rule 1113 – Architectural Coatings. As part of the adopted resolution, the Board directed staff to report to the Board in December, 2003 and December, 2004. The report also addresses the additional coating categories proposed for new limits as part of the most recent proposed amendments to the rule.
- **Technology assessment report on lacquer coatings as required by Rule 1113.**

Background

The 2003 Air Quality Management Plan (AQMP) indicates that the contribution of VOC emissions from architectural coatings continues to be one of the most significant non-mobile sources attributable to ozone pollution within the District. Based on the report “1997 Annual Average Emissions by Source Category in the South Coast Air Basin,” more than 50 tons per day of VOCs are from architectural coatings. VOCs react in the presence of sunlight to form ozone. Ozone is a colorless, pungent gas, which can damage lung cells and may be linked to permanent lung damage. Ozone can cause short-term health effects such as chest pain, coughing, nose and throat irritation, and has been linked to increased symptoms for those with asthma and bronchitis. Ozone formation continues to be problematic for the South Coast Air Basin (Basin) necessitating citizens living in the area to spend more than 2.6 billion dollars annually on health care services. As of October 12, 2003, the Basin had experienced 65 days of unhealthy air quality (more than double the next two smoggiest areas in the country), when ozone levels exceeded the federal one-hour ozone standard of 120 parts per billion (ppb).

The District considers VOC reductions from architectural coatings to be a critical component of its attainment strategy, and as such, is committed to working with industry, academia, other agencies, societies and associations at all levels, to achieve the air quality standards that all citizens in the Basin deserve. Success in achieving future reductions depends largely upon the continued participation and support in many aspects of architectural coatings research and development, as well as product distribution, application and outreach. With this in mind, this report provides information on milestones, accomplishments and issues associated with the implementation of Rule 1113.

Since the last amendments to Rule 1113 in December 2002, District staff has continued to assess various coating categories as part of the 2003 rule development efforts. This work looked at the availability and performance characteristics of the products that are included as part of this technology assessment. A key component of the proposed 2003 amendments to Rule 1113, clear wood finishes, including lacquers, have been extensively

reviewed. This report is intended to give the Board an overall perspective as to the performance and acceptability of low- and zero – VOC coatings that are in use today across a wide spectrum of coating substrates and environmental conditions. Additional categories reviewed in this report include: Floor Coatings, Industrial Maintenance Coatings, Non-Flats, Primers Sealers and Undercoaters, Quick Dry Enamels, Quick Dry Primers, Sealers, and Undercoaters, Rust Preventative Coatings and Specialty Primers.

Meetings

Following last years annual report to the Board, the District has continued to have meetings with the Rule 1113 Working Group and Technical Advisory Committee (TAC). Each individual on the TAC is also a member of the Working Group and as such, many of the issues directly relating to coating technologies in the 2003 proposed amendments were addressed at the numerous Working Group meetings. Each meeting shown below provided an open forum for discussions relative to future VOC reductions from architectural coatings. The discussions have included the many specialty categories where VOC limits could be lowered, as well as other potential options like transfer efficiency, to help achieve the air quality goals of the AQMP. The following meetings took place during this reporting period:

March 20, 2003	Working Group Meeting and TAC Meeting
May 6, 2003	Working Group Meeting and TAC Meeting
July 16, 2003	Working Group Meeting
August 19, 2003	Working Group Meeting
September 4, 2003	Public Workshop
September 30, 2003	Working Group Meeting
October 16, 2003	Public Consultation Meeting and TAC Meeting

Low- and zero-VOC architectural coating products are in wide use today. However, due to concerns from a few manufacturers that the necessary time for research, development and public acceptance of new products is lacking, the District has proposed to extend time periods for categories that need more performance testing, including exterior stains. The remainder of this report reviews staff findings of available products in many different coating categories based on various forms of data gathering techniques that substantiates the proposed future VOC limits in the Table of Standards for Rule 1113, Architectural Coatings. Additionally, there is also a review of two compliance options available in the rule for coating manufacturers and applicators: exemptions for small containers and averaging.

Surveys, Field Application Site Visits and Other Methods for Evaluating Coating Availability and Performance

CARB Survey

The California Air Resources Board (CARB) periodically conducts architectural coating surveys intended to ascertain specific information such as the VOC content and sales volume of architectural coatings from manufacturers that have markets for their products in the state. CARB surveys have been conducted in 1976, 1981, 1985, 1989, 1993, and 1998 and have progressively become more comprehensive. CARB recently completed an evaluation of sales data supplied from coating manufacturers for the year 2000 and also obtained data for the coating formulations.

The 2001 CARB Survey (2000 sales data) categorized the architectural coatings statewide sales data into 51 coating categories from their suggested control measure that correspond to the 42 coating categories in listed in the Table of Standards in Rule 1113. The survey identified more than 98 million gallons of architectural coatings sold in California in 2000, with 83 percent of that volume coming from waterborne products and the remainder from solventborne coatings. Although waterborne products represented 83 percent of the volume, they only contributed to 41 percent of the total emissions, while the solventborne products, representing 17 percent of the sales volume sold, contributed to 59 percent of the total. Coating sales in the District are estimated based on population and represent 45 percent of those sold statewide. CARB staff assumes the relative distribution of waterborne and solventborne coatings is similar throughout the state.

Trends in the amount of coatings being sold in the state have been extrapolated from the CARB surveys over the years and are shown in the following table. The surveys have been designed to ascertain the quantity of architectural coatings sold in California and the associated emissions. It should be noted that the surveys have varied in content and format; therefore, it is not always possible to make a direct comparison between results from different survey years.

California Air Resources Board Architectural Coatings Volume and Emissions Trends

Survey Year	Volume (gallons)	Emissions (pounds) ¹	California's Population	Gallons/capita	VOC Emissions Pounds/ capita	Surveys Mailed Out	Companies Reporting Sales
1975 ³	48,206,000	95,776,000	21,538,000	2.2	4.4	N/A	N/A
1980 ³	57,247,000	106,211,000	23,782,000	2.4	4.5	N/A	N/A
1984	58,481,000	112,532,000	25,816,000	2.3	4.4	~400	143
1988	77,876,000	96,056,000	28,393,000	2.7	3.4	N/A	130
1990	77,056,000	91,842,000	29,944,000	2.6	3.1	N/A	174
1996	87,496,000	85,142,000	32,383,000	2.7	2.6	>700	152
2000	98,455,172	93,629,000	33,871,648	2.9	2.8	>700	182

1. Emissions include emissions from thinning and cleanup solvents.

2. N/A = Not Available

3. No formal survey reports were published.

The data obtained from the coating manufacturers delineates the product information into specific coating categories and indicates an increase in the overall sales volume of lower VOC products in many categories that meet the District's proposed future limits. For many of the specific coating categories being reviewed for this report, CARB has assisted

District staff in comparing the 2000 sales data provided by manufacturers with the previous 1996 data collected. The comparative analysis in Appendix A indicates the floor coating category continues to show a large percentage of the total sales in the less than 50 g/l VOC range with sales in 2000 more than double the 1996 sales. The category for Primers, Sealers and Undercoaters continues to show large sales volumes of coatings meeting the 2006 limits in Rule 1113, Architectural Coatings, of less than 100 g/l VOC.

Although some of the categories do not reflect notably large increases in the sales volume of lower VOC products and others indicate decreases, this may be attributable to past rule exemptions for certain categories such as Quick Dry Primers Sealers and Undercoaters and the available small container exemption. This should not be considered as indicative of lower-VOC coatings not being available.

Specific Coating Category Assessments by District Staff

As mentioned in the background discussion, architectural coatings are a large contributor to VOC emissions in the Basin requiring detailed attention by District staff to continually evaluate coating products that are commercially available and that meet current and future VOC limits as established in Rule 1113. An analysis of technical data sheets (TDS) and material safety data sheets (MSDS) published by coating manufacturers is one methodology used to complete assessments of available coatings. A summary of this assessment is in Appendix B of this report and lists compliant coatings for the categories studied that range from zero-VOC to the current VOC limits established in the Table of Standards. This list is continually updated as staff reviews additional information on compliant and super compliant architectural coating products.

Staff has visited many job sites where architectural and other coating operations are being applied or have been applied. The data gathered is used to substantiate the availability, use and performance of low-VOC coating products. The categories reviewed as part of the ongoing technical assessment are outlined on the following pages. Not all categories reviewed include actual site visits to locations where these low-VOC coatings have been applied, however extensive literature review and available sales data as previously discussed in the CARB survey clearly indicate that these coatings are in wide spread use throughout the Basin.

Clear Wood Finishes

Clear wood finishes as defined in Rule 1113, include coatings that are applied to wood substrates to provide a solid film. Clear wood finishes may be applied to various products consisting, but not limited to, cabinets, doors, molding, paneling, windows, decks, benches, siding and floors (including bowling alleys). Staff has conducted an extensive review of product data sheets and has determined that there are many coating manufacturers offering a variety of clear wood finish products that are well below the proposed 275 g/l limit. Appendix B of this report lists nearly 40 products that are currently available in this category, over half of which are well below 200 g/l of VOC. As part of ongoing rule development efforts and technical assessment of various coating categories, staff has conducted site visits where low- and zero- VOC clear wood finishes have been applied.

Specific examples include zero-VOC stains and clear wood finishes manufactured by Silvertown Products. This manufacturer has a product line that includes five transparent exterior finishes, seven semi-transparent exterior finishes and seven opaque products that are sold throughout North America. Staff has visited the manufacturing plant and evaluated the various products that have been applied and subjected to outdoor exposure at the facility. Additionally, staff has obtained samples and applied them to benches at the District for outdoor exposure that includes a zero-VOC clear wood finish (Rhinoguard Deck and Siding Finish). District staff, that have applied the coatings, have commented on the ease of application and have stated that the coating appears to be holding up very well to the elements. The president of the company has indicated that his products are replacements for varnishes. He also said that the U.S. Department of the Interior and Agriculture specify his Rhinoguard products for applications based on durability and appearance.

District staff has conducted visits to facilities that applied other zero-VOC clear wood finish products including Park Water Company, where JFB Hart Coatings are used extensively for all substrates. Park Water Company has been using JFB Hart Coatings for over seven years and applies both clear and pigmented zero-VOC finishes to wood, steel, concrete, roof and canvas substrates. The clear finishes applied to wood and other substrates include JFB Hart's HP-105 Clear, a two component zero-VOC coating. Painters working for the main coatings applicator for Park Water Company, Specialty Industrial Coatings Corporation (SICC), have stated that the coatings are easy to apply and are durable. SICC stated that they also retain their gloss very well.

Other site visits of applications of clear wood finishes that meet the proposed limit of 275 g/l includes Barneys of New York in Beverly Hills where BonaKemi products were applied. BonaKemi USA manufactures and sells the BonaTech MEGA® Brand Floor Finish that has a VOC of 250 g/l. This product is specifically designed for use on heavy-traffic interior residential and commercial wood flooring. The resin system used in this single-component product is polyurethane. Independent testing conducted by Colorado State University and the Taber Abraser testing indicate that the "MEGA® outperforms all other competitor's waterborne and oil-modified finishes." The BonaTech MEGA® Satin Floor Finish was applied to the fourth and fifth story wood floors at the Barneys of New York site. The contractor applying the less than 250 g/l VOC product stated that he uses the clear coating on most of the commercial and residential jobs he does and says he is a "big fan" of the product and that it is real durable. He estimated that Barneys of New York would not need a maintenance coat for approximately five years.

Another line of low-and zero-VOC products manufactured by Fuhr International is currently being marketed in Southern California for use on wood substrates. Fuhr International manufactures and sells a Multi-Purpose Ultra Clear Urethane, which is a waterborne self-sealing, self-cross linking, modified urethane finish. This product was originally designed for hardwood flooring, but has also been used on high-end furniture, passage doors, millwork, windows and cabinetry for both interior and exterior uses. The VOC content is 160 g/l and the product can be used in the field or in the shop. Fuhr International also manufactures a Waterborne Acrylic Varnish, a waterborne, self-sealing, self-cross linking finish, that is recommended for use on furniture, molding, passage

doors, millwork, and wine racks. The VOC content is 73 g/l, and the product meets the Kitchen Cabinet Manufacturers Association (KCMA) finish coat testing requirements for the kitchen cabinet industry. Staff had an opportunity to visit a small cabinet manufacturing company in Mira Loma called Kitchen Idea that applies Fuhr's Acrylic Varnish to their finished products. The facility representative stated that they apply the clear finish in their paint spray booth and often do "touch ups" in the field after installation of the cabinets are complete. He is very pleased with the quality of the product.

The Kitchen Cabinet Manufacturer's Association (KCMA) sets standards for the strength of cabinetry and the durability of applied coatings under the American National Standards Institute Approved ANS/KCMA A161.1-2000. In order to pass the KCMA test and carry the KCMA approval rating the coating is subject to the following:

- Finishes must withstand 120 degrees F at 70 percent relative humidity for 24 hours without showing appreciable discoloration and not showing evidence of blistering, checking, or other film failures.
- A similar hot and cold cycle (120 degrees F to room temperature and then to -5 degrees F) repeated five times without film failures.
- Exposure to vinegar, lemon, orange and grape juices, catsup, coffee, olive oil, and 100 proof liquor for 24 continuous hours and mustard for one hour, without showing discoloration, stains, or whitening (that will not be dispersed by ordinary polishing) and cannot blister, crack or show film failures of any kind.
- Cabinet door edge 24 hour submersion in soapy water without delaminating, or swelling, and no film failure.

There are several compliant waterborne coatings that pass the KCMA tests.

Manufacturers of these coatings include SDA/Craft Technologies and Fuhr International as previously mentioned. SDA/Craft products that received the KCMA approval are also used in field applications. Staff has had the opportunity to visit field locations and paint manufacturing facilities where these coatings have been applied and in use for many years.

In addition to the many site visits for clear wood finishes, District staff has reviewed the Technology Assessment for Rule 1136 – Wood Products Coatings completed earlier this year. The results of the technical assessment and the industrial progress reports required under Rule 1136 indicate that the technology exists and is in use today in the form of many resin and solvent systems that are less than 275 g/l of VOCs for application to wood substrates. The significant number of large and small companies that conduct a variety of wood finishing operations that meet the proposed 275 g/l VOC limit for clear wood finishes in Rule 1113 are a strong indication of the feasibility of these low VOC products. District staff has observed the application of these products in production settings and have spoken directly with facility representatives. Based on direct observations and testimony from facility representatives, District staff has concluded that these same products can and are being successfully used in architectural coating situations. Many of the products used in the manufacturing plants are sold to field contractors where they are sprayed on unfinished wood products such as kitchen cabinets

in residential homes and other appurtenances in office buildings. Often times, once the products are installed, touch-up for scratches or other damage caused during shipping or installation is necessary and the same products used in the manufacturing process are applied in the field. Additionally, discussions with manufacturers who supply the same products for shop and field finishing, have corroborated staffs conclusions that the products in use in the manufacturing wood products industry (Rule 1136) that are well below 275 g/l VOC can readily be used in field applications (Rule 1113).

Farwest Paint Manufacturing Co. manufactures and sells a Semi-Gloss Aquathane Waterborne Floor Finish formulated with a modified aliphatic urethane dispersion. The technical information indicates that the product is “primarily designed as a high abrasion resistant coating for hardwood floors; but is widely used for kitchen cabinets, coffee tables, fine wood furniture, table tops, clear wood trim varnish, etc.” The solids content is greater than conventional nitrocellulose lacquers, making film build and aesthetics better than a conventional system. The VOC content is 186 g/l.

ICI/Dulux manufactures and sells the WOODPRIDE™ Interior Waterborne Aquacrylic Gloss Varnish with a VOC content of 191 g/l, formulated with of a hybrid acrylic/urethane technology. The technical information indicates that this product “provides durable, transparent protection for interior wood surfaces such as cabinets, doors, woodwork, paneling, furniture and floors.” The product is also resistant to abrasion, chipping, marring, water, oil, alcohol and blushing.

Flats

Flat Coatings as defined in Rule 1113 are coatings that register a gloss of less than 15 on an 85-degree meter or less than 5 on a 60-degree meter. Most coating manufacturers have had products much lower than 50 g/l of VOC since the early 90's. There is information on more than 25 coatings (see Appendix B) currently available that are well below the final effective limit of 50 g/l by July 1, 2008. This list of ultra-low flat coatings include ones from major manufacturers such as the Sherwin-Williams Company, ICI Paints, Frazee, Vista Paint and Dunn-Edwards Paint Corporation. The 2001 CARB Survey substantiates the availability of these less than 50 g/l VOC containing coatings with sales data that indicates nearly 3 million gallons sold in the year 2000, over 8% of the total market share for this coating category, even eight years before the implementation date.

Industrial Maintenance Coatings

The industrial maintenance coating category has been the subject of various coatings studies conducted by other agencies and also a contract awarded by the District. In 1998, the District contracted with National Technical Systems (NTS) to obtain performance data for zero-, low-, and high-VOC industrial maintenance coatings. The results of the study showed that the zero- and low-VOC coatings tested were similar in weathering and durability characteristics and in many cases outperformed the high-VOC solventborne counterparts.

District staff formed a committee in September 1999 comprised of representatives from Metropolitan Water District (MWD), Department of Water Resources, Cal Trans and the

Department of Water and Power to conduct a technology assessment for the Essential Public Service Agencies (EPSA). The study is being completed in multiple phases and is designed to test and evaluate VOC-compliant coatings necessary for maintenance and new construction projects for agencies essential to the public. Approximately 150 VOC compliant industrial maintenance coating systems have already been applied and are undergoing environmental testing over a three to four year period. District staff plans to present the results of this study to the industry and the Governing Board upon completion of all testing.

The Southern California Alliance of Publicly Owned Treatment Works (SCAP) initiated an independent study in September 2000 to identify low-VOC coating systems suitable for wastewater treatment and conveyance facilities. The research effort, contracted to KTA-Tator, evaluated the relative performance of these low-VOC atmospheric and immersion coating systems both in laboratory testing and two-year field exposure. The results of the study indicated that compliant coating systems meeting the performance criteria for wastewater environments, are currently available and District staff believes that the overall results presented in the SCAP study continue to support the future VOC limits in Rule 1113.

In addition, results of past studies indicate the availability of industrial maintenance coatings that meet the future limits of the rule. Staff continues to obtain additional information from site visits and TDS and MSDS analysis. Appendix B includes over 25 Industrial Maintenance Coatings between 100 and 250 g/l of VOC, with an additional 77 products that are well below the July 1, 2006 100 g/l VOC limit. Although there are many coatings available in this category that meet the future limits, some industry representatives and coating manufacturers contend that they are not all compatible in all situations. The District is committed to working with the EPSA's and coating manufacturers in additional studies necessary to test low- and zero-VOC products for use in severe environmental conditions.

Nonflat Coatings

Nonflat coatings as defined in Rule 1113 – Architectural Coatings are coatings that register a gloss of 5 or greater on a 60 degree meter and a gloss of 15 or greater on an 85 degree meter. The 2000 CARB State Suggested Control Measure for Architectural Coatings further defines Nonflat - High Gloss coatings as those that register a gloss of 70 or above on a 60-degree meter. These gloss values are indicated in the 2001 CARB Survey as Nonflat - High Gloss, Nonflat – Low Gloss and Nonflat – Medium Gloss. For purposes of statistical analysis relative to VOC limits in Rule 1113, District staff has analyzed the data by grouping it all into one Nonflat category. The results indicate that for the 2000 sales data supplied by manufacturers 52% were below the current 150 g/l VOC limit that became effective in January 2003, nearly three years prior to the rule change. Over 2.4% of the coatings sold in 2000 under 150 g/l were less than the July 1, 2006 VOC limit of 50 g/l. In the three year period since those low-VOC coatings were being marketed, the list of currently available ultra-compliant nonflats continues to grow, as indicated by staff reviews and updates of information based on TDS's and MSDS's. There are currently over 32 coatings listed in Appendix B that are below 50g/l.

Coating manufacturer representatives have expressed concerns regarding meeting the future limit for Nonflat - High Gloss coatings currently categorized as general Nonflats under Rule 1113. Although there are options available to manufacturers such as averaging provisions or small container exemptions, the District is committed to further research in this area. District staff has discussed this issue with the TAC and is maintaining an open dialog to possibly conduct additional testing for Nonflat - High Gloss coatings.

Primers, Sealers, and Undercoaters

An analysis of currently available primers, sealers and undercoaters clearly shows that the future VOC limit of 100 g/l VOC by July 1, 2006 is attainable today. More than 65 coatings have been identified, through TDS's and MSDS's, below 100 g/l VOC that are applicable to a wide variety of substrates and provide physical coating characteristics that meet or exceed the standards that are expected of higher VOC products from industry and consumers.

Data that has been reviewed from the 2001 CARB Survey (2000 sales data) shows that even nearly three years ago, over 80% of the products sold in California were meeting the limit of 200 g/l VOC that has just come into effect in January 2003. Additionally, that same sales information from the year 2000 shows that more than one-third of the total sales in this coating category as reported by manufacturers were below 100 g/l VOC.

Quick-Dry Enamels

Quick-dry enamels are a subcategory of non-flats, and have historically used alkyd-based resin technology, which is a reaction product of a polybasic acid, a polyhydric alcohol, and a monobasic fatty acid or vegetable oil (triglyceride). This solventborne technology exhibits versatility in formulating performance properties with economy, and has a wide range of compatibility with other film formers. Gloss and dry time characteristics are realized through compositional variation.

In 1998, the District contracted with National Technical Systems (NTS) to obtain additional performance data for zero-, low-, and high-VOC coatings. The NTS study compared the dry times of zero-VOC nonflats, low-VOC, and traditional quick-dry enamels, and concluded that the zero-VOC nonflats had quicker dry times, even under higher humidity conditions.

The District is continuing assessments of this category and may conduct additional studies in the near future to verify the attainability of the 50 g/l VOC limitation effective July 1, 2006. Rule 1113 also allows manufacturers of Quick-Dry Enamels to average these products under the Averaging Compliance Option or take advantage of the small container exemption provided.

Quick Dry Primers, Sealers, and Undercoaters

In February of 1990, significant amendments to Rule 1113 included the removal of exemptions for 11 specialty coating categories based on the CARB-CAPCOA SCM. Following the adoption of those amendments, legal action was taken against the AQMD and several other Air Pollution Control Districts including CARB and CAPCOA,

claiming that the amendments did not comply with CEQA. On August 21, 1990, the Superior Court of Los Angeles County entered a judgment against AQMD in the case Dunn-Edwards Corporation, et al. vs. SCAQMD, et al. The judgment denied in part and granted in part, the petition for writ of mandate seeking to overturn certain amendments. As a result, the AQMD was prevented from enforcing the amendments relating to aerosol coatings, industrial maintenance coatings, lacquers, quick-dry enamels, and quick-dry primers, sealers and undercoaters.

Based on the Superior Court decision, quick-dry primers, sealers, and undercoaters continued to be exempt under the January 1990 version of Rule 1113 - Architectural Coatings, provided manufacturers submitted annual reports to the Executive Officer. The May 1999 amendments further established a VOC limit for quick-dry primers, sealers, and undercoaters at 350 g/l and included an averaging provision to allow manufacturers to average the VOC content of their quick-dry primers, sealers, and undercoaters, on a sales weighted basis. The exemption for Quick-Dry Primers, Sealers and Undercoaters was deleted on January 1, 2003 from the rule.

District staff's review of TDS's and MSDS's shows over 30 coatings that meet the definition of a Quick Dry Primer, Sealer, and Undercoater that are well below the future limit of 100 g/l VOC and that are available and in use today.

Additionally, past studies, including the NTS Study discussed earlier, have shown that zero- and low-VOC primers actually dry faster than the quick-dry primers, sealers, and undercoaters. Product data sheets of manufacturers of many coatings in this category indicate that the dry-to-touch and recoat times are met.

This category has been subsumed into the Primer, Sealer, and Undercoater Category and now has the same VOC limits. Since there are many coatings currently available that meet, and are much less than the future limit, the District believes that the future compliance date should give those few manufacturers having concerns adequate time to reformulate.

Roof Coatings

Under the roof coating category, District staff has reviewed technical and material safety data sheets of base coats and topcoats that meet a VOC limit of 50 grams of VOC per liter, less water and less exempt compounds. One such product is Geocel 9500MB – Elastomeric Coating. This product is specifically designed for application to metal roofs and siding and is a blend of polymers and ethylene propylene diene monomer (EPDM). It forms a rubber membrane that is flexible, ultra violet (UV) light and mildew resistant and has a 5 year durability limited warranty. This product may be brushed, rolled or spray applied. Application temperature is limited to 45 degrees Fahrenheit or above. The VOC content, less water, is listed as 36 grams per liter VOC.

Another product in this category is United Coatings Roof Mate. This is an EPA Energy Star rated, elastomeric, 100 percent acrylic top coat for metal, built-up, modified bitumen, concrete, sprayed in place foam, Hypalon and EPDM, as well as composite shingle roofs. It forms a membrane that is highly reflective, flexible, and breathable, as

well as chemical fallout and UV resistant. The product is available with 5, 10 and 15 year warranties and has a listed VOC content of 16 grams per liter, less water, and is sprayable.

Tropical Asphalt has developed a roof coating called #360 Asphalt/Clay Emulsion Basecoat. This product is designed as a basecoat for reflective topcoats and as a waterproofing coating. It is intended to be applied on built up roofing, metal, and masonry surfaces. A better bond occurs when roof surfaces are damp. Two coats are recommended with the use of a brush, roller or sprayer at application temperatures above 55 degrees Fahrenheit. The material should not be applied to PVC or to dry and brittle roofing materials. The VOC content is listed as 30 grams per liter.

The proposed roof coatings category limit of 50 g/l has more than 40 products that are available for application to various roof substrates. On July 31, 2003 District staff met with the Union Roofing Contractors Association and several roof coating manufacturers. The meeting was held for the purpose of: a) discussion of the District's proposed changes to the VOC limit of roof coatings and b) to better inform staff about roof coatings. Six roof coating manufacturers were invited to the meeting and five attended.

The initial discussion involved agreement on what roofing products were subject to Rule 1168 and Rule 1113. After agreement on roof coatings subject to Rule 1113, the subject of aluminum and white reflective roof coatings was discussed. Aluminum reflective coatings have been reformulated from 400 g/l to approximately 100 g/l to meet the current limit of 250 g/l. Some manufacturers said that the aluminum reflective coatings are not necessary. White reflective coatings can be formulated at 50 g/l or less and are more reflective. One manufacturer indicated that CFR Title 24 is mandating high reflectivity coatings that aluminum formulations cannot meet, essentially eliminating these coatings by 2005.

Some manufacturers were of the opinion that low VOC roof coatings work fine in the climatic conditions of the Basin and would not pose an application problem if the manufacturers' recommendations were followed. However, all manufacturers were in agreement that using these products could be a problem in many other parts of the United States due to adverse climatic conditions.

The meeting concluded with all parties in agreement that the proposed 50 g/l VOC limit for roof coatings if implemented by 2005, would be feasible and not pose any problems for the manufacturers.

Rust Preventative Coatings

Data obtained from the CARB 2001 Survey indicates that over 19% of all sales reported within this category in the year 2000 were at a VOC level below 200 g/l, compared to 5% in 1996. This is half of the currently allowable limit in Rule 1113 and is an indication that sales of lower VOC products in this category are increasing. Additionally, there are zero-VOC products available that are designed as single component direct-to-metal coatings that provide corrosion resistance for interior and exterior metal surfaces. An example is a zero-VOC product manufactured by Sierra Performance (Rust-Oleum)

called Metalmax™ DTM Acrylic Urethane Enamel. The total sales of products in this category are relatively small in the Basin and last year total reported sales from manufacturers amounted to 53,000 gallons. Also, manufacturers continue to have options available within this category to average their coating products or take advantage of the small container exemption provision allowed in the Rule 1113.

Specialty Primers

Rule 1113 defines specialty primers as coatings that are intended to seal fire, smoke or water damage, or to condition excessively chalky surfaces.

According to sales data supplied by manufacturers and available for review in the 2001 CARB Survey, approximately 80% of the total market volume within this category is below the future limit of 100 g/l VOC, effective July 1, 2006 (includes stain-blocking products). District staff does not foresee this future limit to be problematic for the remaining 20% of the sales to meet the requirements in 2006. Many of the coatings that fall within other categories, such as primers, sealers and undercoaters, meet the stringent requirements for specialty primers such as the need to condition excessively chalky surfaces or to seal fire, smoke, or water damaged surfaces.

Stains

Appendix B lists numerous low solid stains that meet the proposed limit of 100 g/l VOC by July 1, 2006. An example is the Okon Company that manufactures and sells a product called DECK STAIN, which is a waterborne water repellent and wood stain for horizontal wood applications. This product has a VOC of approximately 100 g/l, and is designed for decks, milled, pressure-treated, and rough lumber. ASTM test results show that this product performs equally or better than its higher-VOC counterparts. For example, this product passes the QUV 1,000 hour test for Ultraviolet light resistance, as well as ASTM D3359-90 for vapor transmission.

Columbia Paint & Coatings manufactures and sells the Woodtech Solid Color Pre-Stain (09-870), a low VOC (62 g/l) interior and exterior stain for bare wood substrates. The technical information from the manufacturer indicates “excellent color retention, good penetration, and recoat properties.” The company representative indicated that this product forms a hard film that is abrasion resistant.

Epmar Corporation, a subsidiary of Quaker Chemical Company, also manufactures and sells a variety of low-VOC stains including pigmented, clear and semi-transparent. The Kemiko Transparent Stain is a single component product recommended for use on concrete, plaster, polymer cement and wood. Applications include walkways, decks, hospitals, schools, shopping malls, restaurants and theme parks. The VOC content is less than 30 g/l.

The Sherwin Williams Company manufactures and sells an Exterior Solid Color Acrylic Latex Stain – A16 Series under their ProMar® product line that has a VOC content of 97 g/l. This is a 100 percent acrylic product recommended for use on vertical wood, rough sawn lumber, textured or abraded plywood, siding shakes and siding shingles.

Smiland Paint Company, a local manufacturer, sells the Exterior Acrylic Solid Color Rustic Stain for use on exterior wood, masonry, concrete, stucco, properly primed metal and previously painted surfaces. The technical information indicates that this product provides “excellent protection for rustic wood surfaces such as rough sawn lumber, vertical shakes and shingles, fences, and masonite or hardwood siding.” The VOC for this stain is 97 g/l.

Dunn-Edwards Corporation, a local company, manufactures and sells the ACRI-FLAT® product, which is listed as an Exterior Wood Stain and Masonry Flat Paint (W 704). The technical information from the manufacturer indicates that “ACRI-FLAT is extremely versatile and is ideally suited as a self-priming solid color stain for new or previously painted rough sawn wood.” The VOC content of this product is 70 g/l.

The stain category as defined in the rule includes various substrates and as such, staff continues to review wood and concrete stains as part of the rule development efforts. Often times, the same facilities that apply clear wood finishes using low- and zero-VOC coatings also utilize similar ultra compliant products for the staining of the substrates prior to application of a clear coat. This is the case with several site visits by staff, including the previously mentioned visit to Kitchen Idea. During the manufacture of the wood cabinets, a zero-VOC stain manufactured by Fuhr International (ZVOC Universal Stain 155) is applied prior to the clear topcoat. Fuhr International also manufactures a Wiping Stain that has a VOC content of 15 g/l. This product is recommended for any wood surface, does not affect grain raising and is available in a wide range of colors. The technical information provided from the manufacturer indicates good open time and workability for wiping applications. Fuhr International also manufactures a ZVOC® Exterior Waterbased Stain that provides “excellent substrate wetting and color control, overall durability, and chemical resistance, with minimal grain raising.” This product has no VOCs.

A review of the data, from the progress reports for Rule 1136, indicates the use of low-solid stains that currently meet the proposed limit of 100 g/l VOC in Rule 1113. Staff has researched and witnessed the application of the existing low-VOC wood coating technologies and has determined that they are feasible for an extremely wide range of wood coating operations that can be readily carried over to field applications. As previously mentioned in this report, based on staffs direct observations and testimony from facility representatives and coating manufacturers, the same products can and are being successfully used in architectural coating situations. The products used in the manufacturing plants are sold to field contractors where they are sprayed on a variety of unfinished wood products or used to touch-up prefinished goods that were damaged during shipping or installation .

Staff has obtained stain samples from Silvertown Products that was previously mentioned, and have applied them to benches located at the AQMD prior to application of the zero-VOC clear topcoat. The zero-VOC stain manufactured by Silvertown Products used in the bench exposure study is called Rhinoguard Wood Defense Deck and Siding Finish, Honey. The products appear to be holding up well to the outdoor

environment they are subjected to on a daily basis, including significant amounts of sun and moisture exposure.

In the development of the 2003 Phase III amendments to Rule 1113, Architectural Coatings, industry has raised issues regarding the availability and performance of stains applied to horizontal high traffic areas. Staff will continue to work with the TAC in assessing the coatings in this category and may conduct future performance characteristic studies.

Waterproofing Sealers, Waterproofing Concrete/Masonry Sealers & Floor Coatings

The coating category of Waterproofing Sealers has an extensive list of low- and zero-VOC products that are already available and have desirable performance characteristics such as durability, abrasion resistance and appearance. Appendix B of this report lists numerous waterproofing sealers and waterproofing concrete/masonry sealers that are well below the current limits and meet the future proposed limits of 50 g/l VOC by January 1, 2005.

Davlin Coatings, Inc. manufactures and sells a waterproofing sealer (Acrylastic 490) that is marketed as a high-build, decorative, extremely flexible, high performance waterborne waterproof wall coating. It is recommended for use over cracked, uneven surfaces, especially where water penetration is a problem. The VOC content is 29 g/l, well below the proposed limit for waterproofing coatings. Testing, based on widely accepted ASTM methods, indicates excellent performance for tensile strength (ASTM D2370 – 2,400 l in./min), moisture vapor transmission (ASTM E96, Proc. B – 1.2 perms), peel adhesion, concrete (ASTM D413 – 48 psi), alkali resistance (Fed. Spec TT-C-555B, GSA ex. 1 – no effect), and resistance to wind-driven rain > 100 mph (Fed. Spec. TT-C-555B – no weight gain). These results are equal or superior in terms of overall performance when compared to higher-VOC counterparts. Overall life of the coating is estimated to be double the performance of competitors with higher VOCs.

Degussa AG, through its North American construction chemicals division ChemRex, manufactures and sells a concrete and masonry waterproofing sealer (Thorocoat DOT) that is marketed for US Department of Transportation (DOT) applications. The product has a VOC content of 58 g/l and is a high-build film forming waterborne acrylic coating that can be applied on vertical or overhead new or aged concrete and previously coated surfaces. The product has passed several DOT specific tests, such as accelerated weathering (ASTM G23 - 5,000 hours), wind-driven rain (Fed. Spec. TT-C-555B - pass), water vapor permeance (ASTM D1653 - 13 perms), salt spray resistance (ASTM B 117 - 300 hours), abrasion resistance (FTMS 141a - 3,000 +), impact resistance (FTMS 141a Method 6191 - 2.7 m/m), freeze-thaw resistance (FL DOT Section 400-15.2.6.7a - 50 cycles). All these characteristics are typical for the material applied in two coats at a dry film thickness of 16 mils. The product is delivered in DOT-required colors.

Everest Coatings manufactures and sells EVERCOAT 7000S, High Modulus Waterproof Coating, a single component product that conceals irregularities, fills cracks, and provides excellent waterproofing on a variety of masonry substrates. This coating

utilizes acrylic resin technology supplied by Rohm and Haas, and has a VOC of 69 g/l, with a percent solids volume of 60 percent. According to the technical information, this product exhibits excellent resistance to the elements and U.V. degradation, has alkali-resistant pigments, and is mildew resistant. The recommended uses include aged, new and previously painted above-grade masonry, concrete, concrete block, and stucco.

GE Sealants & Adhesives, manufactures and sells VP1550 CONCENTRATED WATER REPELLANT (VIP1550), which is a high performance, breathable, clear, water repellant sealer that penetrates deeply into concrete and masonry surfaces without altering the natural appearance of the substrate. This product contains silanes/siloxanes and is recommended for use on concrete driveways, walkways, brick paver and patio deck steps, as well as vertical masonry surfaces including stone, tilt-up concrete, brick, clay tile, and block. Information provided in technical data sheets indicates the VOC content is 0.5 g/l, and the product provides excellent water repellency to reduce cracking, spalling, freeze/thaw damage, chemical degradation, biological growth, efflorescence and dirt pickup.

L&M Construction Chemicals, Inc. manufactures Aquapel & Aquapel Plus, a micro-emulsion, silane/siloxane water repellant bonds directly with the substrate, resulting in very good resistance to moisture and salt, and has a VOC of less than 50 g/l. This product is recommended for use on buildings, parking decks, monuments, garages, driveways, dams, piers or any other concrete surfaces. Technical data, from the manufacturer indicates that water adsorption was reduced by 85 percent and chloride intrusion by up to 90 percent. Both products exceed NCHRP 244, Series II requirements for salt and water penetration.

Rainguard International Products Company, a local manufacturer, manufactures and sells Blok-Lok®, a clear water repellant with a VOC content of 37 g/l that is comprised of polysilanes. This product is recommended for use on masonry block, concrete, stucco, cement plaster, and other composite construction materials. Testing based on ASTM procedures conducted by the manufacturer shows that the product equal or superior performance to its higher VOC counterparts. For example, ASTM E-514-86, Wind Driven Rain tests indicate that the use of Blok-Lok® reduces leak by 98.7 percent, reduces chloride ion intrusion (NCHRP No. 244), and allows 100 percent water vapor transmission (ASTM D-1653).

Sherwin Williams manufactures ConFlex XL, a textured high-build acrylic elastomeric coating recommended for concrete tilt-up, precast, poured-in-place concrete, CMU, and stucco. The technical information indicates “excellent flexibility, durability, and weather resistance”. This pigmented waterproofing sealer has a VOC of 94 g/l. Testing done for or by Sherwin Williams, using ASTM methods, indicate elongation of 300 percent based on ASTM-D412. This coating also passes low temperature flexibility and freeze-thaw resistance tests, based on ASTM D522 and ASTM D2243, respectively.

Smiland Paint Company, under their Morwear Label, manufactures and sells a Clean Elastomeric Waterproofing Sealer (2571-70) recommended for application to new or old, above grade, dense or porous concrete, stucco, and masonry surfaces. The VOC is

reported to be 30 g/l, and the technical material from the manufacturer indicates that this product is suitable for damp or dry surfaces, is breathable and permeable to water vapor, and can be applied over substrates previously treated with silanes, siloxanes, urethanes, and acrylic paints. The technical data also indicates that this waterproofing sealer has “excellent elongation (440 percent), excellent tensile strength (400 psi), excellent exterior durability, and excellent water resistance.” These conclusions were based on results from ASTM testing done for the above performance characteristics. Smiland Paint Company also makes and sells an interior/exterior heavy duty waterproofing (2555-70), which is an emulsion of polysiloxane resins, exhibiting a durable and invisible shield against water penetration. This product is recommended for use on “interior or exterior above-grade concrete, masonry, cement blocks, brick, stucco, stones, porous tile, exposed aggregate concrete, sandstone, and slate.” The VOC content of this product is 2 g/l.

Sierra Corporation/TK Products manufactures and sells a WB Silane Concentrate Concrete Sealer (TK-1311) that has a VOC of 59 g/l. This product is a micro emulsion based on silane and oligomeric alkoxysilanes mixed with water. Testing conducted by Wacker Silicones Corporation using the NCHRP 244 test procedures, indicates that chloride and moisture intrusion is reduced by more than 80 percent.

Many of the coatings that fall within the definition of a waterproofing product also meet the performance characteristics of products that are defined as floor coatings and are applied on horizontal as well as vertical substrates. These visits are summarized below.

EPMAR Corporation, a subsidiary of Quaker Chemical Company, manufactures epoxies and polyurethanes. Staff has visited many sites where various clear coats had been or were in the process of being applied, including their Kemiko Acrylic Urethane (<50 g/l VOC), Sta-Crete 3700 Clear Epoxy (<100 g/l VOC) and Sta-Crete 2700 (0 VOC) product lines. Locations where these coatings have been applied and are in use today include the Newport Beach Marriot, the Palm Desert Shopping Mall, Temecula Auto Repair & Radiator, Inc., the Regency Wilshire, Kneedler-Fauchere Studio at the Pacific Design Center, Hope University in Fullerton, the Fairplex at the Los Angeles County Fairgrounds, the Saint Regis Hotel in Dana Point and Atherton Baptist Homes in Alhambra. Facility representatives were pleased with the results and many commented on the nice look, durability and good resistance to UV light of the finishes. The various contractors and applicators commented on coating characteristics such as the ease of application, excellent coverage and quick dry time.

Other products in this category include a line of coatings manufactured by Rain Guard that include low-VOC waterproofing concrete/masonry sealers consisting of both topical and penetrating sealers. This company specializes in penetrating sealers with a VOC content of 37 g/l. Penetrating sealers move into the substrate from one-eighth to one-quarter of an inch and are not as exposed to the environment, therefore protecting the substrate much longer. After application and drying, there is no color change to the substrate. Staff had an opportunity to visit several locations where the penetrating sealers and topical clear coats had been applied recently and as long as seven years ago. Staff also saw a rock and concrete barrier wall on Jamboree Road in Newport Beach that had received an application of this penetrant 7 years ago. The penetrating sealer was Rain

Guard's Clear Water Repellent (37 g/l VOC) followed by a clear top coat of the VandlGuard (87 g/l VOC) anti-graffiti coating. Another location visited by staff included a sound attenuation block wall on Freeway 73 that had an application of Rain Guard's penetrant (Blok-Lok Clear Water Repellent, 37 g/l VOC) and anti-graffiti coating (VandlGuard anti-graffiti coating, 87 g/l VOC).

As previously mentioned, a site visit to Park Water Company by staff was conducted to see first hand the use of a two component zero-VOC product manufactured by JFB Coatings. The clear finish (JFB's HP-105 Clear) applied to the many concrete and masonry structures throughout Park Water Company facilities in Los Angeles County have proven to be well suited for the water resistant characteristics required by the company.

Alternate Means of Compliance

Averaging Compliance Option

The AQMD, working extensively with members of the architectural coatings industry and other stakeholders developed and incorporated an alternative compliance option into Rule 1113, the Averaging Compliance Option (ACO). The purpose of the ACO is to promote compliance flexibility and allow manufacturers additional time to reformulate certain compliant products of their choice. In the November 8, 1996 amendments to Rule 1113, an ACO was included for the Flats category with subsequent amendments on May 14, 1999 designed to streamline its implementation and add categories to provide additional compliance flexibility with the future limits. There are currently eight manufacturers that are utilizing the ACO for averaging a variety of coating categories including flats, nonflats, floor, industrial maintenance, primers, sealers, undercoaters, quick-dry primers, quick-dry sealers, quick-dry undercoaters, quick-dry enamels and rust preventative.

Initially, the first year that the ACO was made available, there were three manufacturers that submitted plans for the period of June 30, 2001 to July 01, 2002, all of which elected to average flat coatings. These three companies were Surface Protection Industries, Dunn-Edwards and Sherwin Williams. Since the concept of averaging was first formalized, certain issues have been prominent in discussions with other governmental agencies such as the availability of records necessary in proving compliance with the approved plans. In response to those concerns and as provided for in the rule, the District has completed a through audit of the plans for Surface Protection Industries and Dunn-Edwards. District staff is currently auditing the Sherwin-Williams' ACO.

The methodology used by District staff to audit Surface Protection Industry (SPI) included four methods used to determine compliance.

1. The first method was to average seven pre-selected (by District Staff) flat coatings from SPI's sales records and then calculate the ratio of the actual emissions divided by the allowable emissions.
2. The second method was to average the same seven pre-selected flat coatings from SPI's Final Report and then calculate the ratio of the actual emissions to the allowable emissions.

3. The third method was to average all the flat coating products from SPI's sales records and determine the ratio of the actual emissions to the allowable emissions.
4. The fourth and final method was to average all the flat coatings from SPI's Final Report and calculate the ratio of the actual emissions to the allowable emissions.

SPI complies with the requirements of their ACO because all four methods resulted in ratios less than 100% for the actual/allowable emissions for this averaging period.

For Dunn-Edwards, the California Statewide and company-wide (four states) ratios for the actual/allowable emissions was also less than 100%. As a check, District staff calculated the higher VOCs (>100 grams per liter of VOC) for Company wide divided by the lower VOCs (\leq 100 grams per liter of VOC) for California Statewide and still obtained a less than 100% ratio for the actual/allowable emissions. The data shows that Dunn-Edwards complied with their ACO Plan for the auditing period, June 30, 2001 to July 01, 2002 since they were well under the 100% ratio for the actual/allowable emissions.

The ACO Program is available to manufacturers that desire to exceed specific coating category VOC limits and District staff has determined through an extensive audit process that the provision is enforceable. The U.S. Environmental Protection Agency may wish to review these conclusions and the results of the audits in the future as part of their review of rule amendments.

Sell Through Option

Another compliance option for manufacturers is an allowance in the rule for the sale or application of a coating manufactured prior to the effective date of the corresponding standard in the Table of Standards for up to three years after the effective date of the standard. This sell-through provision applies to all coatings listed in the Table of Standards and any effective dates applicable to the specific coating.

Small Container Exemption

A third compliance option in the rule enables manufacturers of any products to subject to the rule to exceed the allowable VOC limits stated in the Table of Standards. One such exemption exists for manufacturers that supply coatings in quart containers or less. Statistics on amounts reported by manufacturers seeking an exemption under this portion of the rule are outlined in the following table. An analysis of the submitted information since the year 2000 indicates that some categories are no longer reported, others show a decrease in amounts reported and others an increase. Failure to report usually indicates that the manufacturer no longer needs the exemption. Although the volume of coatings sold in small containers is relatively small compared to the total volume of coatings sold in the Basin, the small container sales have registered significant increases between 2000 and 2002 as shown in the following table.

Gallons Reported Under Small Container Exemption

Coating Category Small Container Exemption	2000 (Gallons)	2001 (Gallons)	2002 (Gallons)
Faux Finishes	128	190	None reported
Flat	246	4,813	24,613
Floor	None reported	70	None reported
Industrial Maintenance	641	None reported	169
Lacquers	2,237	1,333	1,964
Metallic Pigmented	None reported	101	None reported
Multi-Color	109	None reported	None reported
Non-Flat	1,319	19,748	9,503
PSU	18,864	13,225	26,197
QDPSU	1,335	1,651	327
Sanding Sealer	583	735	4,061
Stains	120,299	141,650	220,058
Varnishes	125,764	130,197	186,557
Waterproofing Sealers	197	48	1,798
Total of Small Container Exemption	271,721	313,760	475,247

Zero VOC Coatings

Further advancements of coating technologies continue to have an impact on the use of lower VOC products with improved performance characteristics. Small and large coating manufacturers continue to market products that contain very little and no VOCs. The following table has been updated from the previous annual report to the Board and reflects a partial list of examples of zero- VOC coatings currently available. The District also maintains a web page listing those companies that have expressed an interest in having their products included on the page.

Zero-VOC Coatings Manufacturers				
Manufacturer	Type of Coatings	Interior	Exterior	Phone Number
American Formulators Manufacturers	F, NFE, NFSG	YES	NO	619-239-0321
Benjamin Moore & Co.	PSU, F, NFS, NFE, NFSG	YES	NO	973-252-2650
Bruening Paints				800-852-3636
Coronado Paint Co.	F, NF, PSU	YES	NO	800-883-4193
Diamond Vogel	F, NF, P			800-728-6435
Dunn Edwards	F, NF	YES	NO	888-337-2468
Dutch Boy Paints	NF	YES	NO	800-828-5669
Frazee Industries	PSU, F, NFS, NFE, NFSG	YES	NO	800-477-9991
Fuhr International, LLC	PSU, F, NF	YES	YES	800-558-7437
Galaxy-2010	PSU, F, NFE, NFS	YES	YES	973-790-7641
ICI Paints	PSU, F, NFS, NFE, NFSG*	YES	YES	323-888-8888
Miller Paint	PSU, F, NFE, NFS	YES	NO	503-255-0190
NonToxiCA	F, NFS	YES	YES	800-731-5007
Polibrid Coatings	F, NF, PSU	YES	YES	956-831-7818
PPA Technologies	PSU, F, NF	YES	YES	201-457-1221
PPG (Pittsburgh Paints)	PSU, F, NF	YES	YES	800-441-9695
Richards Paints	F, NF, NFS	YES	NO	800-432-0983
Rodda Paints	PSU, F, NFE, NFS	YES	NO	503-244-7512
Sierra Performance (Rust-Oleum)	PSU, F, NF	YES	YES	800-777-7765
Sampson Coatings	PSU, F, NF	YES	YES	804-359-5011
Sherwin Williams	PSU, F, NFE, NFSG	YES	NO	216-566-2630 x2902
Spectra-Tone Paint	F, NFE, NFSG	YES	NO	800-272-4687
Industrial Maintenance Coatings				
Ameron, Inc.	Various Systems	YES	YES	714-529-1951
Corchem Corp	Various Systems	YES	YES	714-891-4402
Hart Polymers	Various Systems	YES	YES	949-724-9737
Pacific Polymer	Various Systems	YES	YES	800-888-8340
Superior Environmental Products, Inc.	Various Systems	YES	YES	972-490-0566
United Coatings	Various Systems	YES	YES	800-541-4383

PSU = Primers, sealers, and undercoaters
 F = Flats
 NF = Nonflat
 NFS = Nonflat - satin
 NFE = Nonflat - eggshell
 NFSG = Nonflat - semi-gloss

* - Not Available for Exterior Use

Past Coating Studies

An important point of concern for industrial, commercial and consumer applicators of architectural painting products are coating characteristics and availability of low and zero-VOC materials as mandated by current and future limitations in Rule 1113. During past rule development efforts, staff has committed resources to specifically address these concerns.

Prior reports submitted to the Governing Board regarding architectural coatings include coating technology assessments and product availability studies that indicated the availability of compliant coatings in the specific categories studied, many of which are the focus of this rule amendment. Previous studies have shown and new information continues to support staff's position that low-and zero-VOC coatings are as good and in many instances better performing products than their higher VOC counterparts.

AVES Study

The District awarded a contract to AVES, an affiliate of ATC Associates Inc. in May 1999 to develop architectural coatings with a zero- or near zero-VOC content. The project was to develop several zero- or low-VOC substitutes for high-VOC architectural coatings that are commercially used in relatively large volumes. AVES was to demonstrate their technical, environmental and economic feasibility as substitutes. The coatings developed under this project are: opaque stains, exterior and interior semi-transparent stains, waterproofing sealers (clear) and clear wood finishes (lacquers, varnishes, and sanding sealers).

The goal of the project was to develop and demonstrate zero-VOC or low-VOC coatings (varnish, lacquer, stains, waterproof sealers and sanding sealers) to further reduce VOC emissions in the Basin. The target in developing the coatings was to achieve a performance level equal to, or better than similar coatings currently used by the industry. District laboratory analysis confirmed that these new coatings formulated for this project have a VOC content of less than 10 g/l (calculated from GC/MS analysis results).

Most performance characteristics of the new no-VOC wood coating system developed by AVES (including adhesion, beading, chemical resistance, coating penetration, dirt pick-up, dry time, mar resistance, moisture vapor transmission, stain blocking, print resistance, swelling, water uptake, and overall appearance) are equivalent to those of commercial coatings based on the side-by-side comparative testing results. Advantages of these no-VOC coatings include better grain raising for varnish, less color change (for lacquer, varnish, and sanding sealer), better moisture/UV resistance for exterior semitransparent stain, and better water repellent efficiency for waterproofing sealer. However, the dry time, freeze/thaw properties, pot life, mildew/fungus resistance, printing resistance, and stain blocking properties of these no-VOC waterborne coatings are not as good as those of solventborne coatings.

Three popular commercially available coating systems (both lacquer and varnish) were tested side-by-side with no-VOC lacquer and varnish topcoat systems for repair and refinishing. This new no-VOC varnish system showed the best overall appearance after

repair, but had the highest coating usage because the two-component coating resulted in a limited pot life. The new no-VOC lacquer system was the easiest to repair and showed the best gloss after repair.

In order to obtain the impartial opinion of experienced painters on the performance of the new coatings, the painters of Commercial Casework, Inc. in Fremont, California conducted a field demonstration of the new coating system as part of this study. The personnel from Commercial Casework were impressed with the new wood coatings due to fast dry time, ease of use, and the safer working environment resulting from the absence of solvents.

District staff's opinion is that the coatings formulated for this study could readily be applied in typical architectural settings. The final report titled, "Development and Demonstration of Zero- and Low-VOC Resin Technology for Advanced Control Measure Development", issued on March 29, 2001, is included in Appendix C for the Board's review.

Case Studies (USEPA and Midwest Research Institute)

In cooperation with Midwest Research Institute in May of 2000 the USEPA published a set of case studies (EPA-600/R-00-043) regarding the conversion of 25 wood furniture facilities to less polluting coating technologies including high-solids conversion varnishes, waterborne technologies, ultra-violet curable and powder coating. Because of the proposed VOC limits for clear wood finishes for (sealers and varnishes) and of future existing VOC limits for clear and pigmented lacquers, architectural wood coating operations will be limited in choice of higher solids (30-45 percent solids), exempt solventborne catalyzed topcoats, sealers and stains, and may not choose their use because of flammability concerns of the exempt solvents of acetone and methyl acetate. Ultra-violet curable and powder coating operations are not applicable to of architectural wood finishing applications. However, the nonflammable waterborne acrylic and urethane finishes (stains, primers, sealers and topcoats) are being used by wood product manufacturers and these conversions do have applicability to Rule 1113. Out of the 25 conversions, 9 converted from high-VOC wood finishes to waterborne finishing systems. Several different reasons for converting to low HAP (hazardous air pollutant), low-VOC material are cited. Four apply to Rule 1113: (1) less hazardous materials; (2) a commitment to the environment; (3) a desire for a high-quality finish; and (4) a reduction in emissions.

The application of waterborne stains, sealers and topcoats is different than solventborne ones and may cause difficulties. However with proper training all problems encountered by the converted facilities cited in the EPA report were minimized if not solved. For instance, waterborne coatings cannot be flooded-on as standard nitrocellulose products are; they need to be applied in thinner films to prevent coating softness and sagging. The EPA document states that grain raise issues were also minimized, and for some conversions, resulting sanding steps were the same as that used with high solvent coatings and stains, but needed to be done in a different sequence. Once proper drying and sanding has occurred, waterborne systems have harder films than standard one-component nitrocellulose systems, and may be tinted to achieve an amber look if desired.

Color matching was pointed out in the document as being more difficult with waterborne stains, however, with respect to Rule 1113, staff is not recommending lowering the VOC limit for high solids stains (formulated both in solvent and in water at 250 grams VOC per liter, less water and less exempt compounds). Restrictions for stains purchased in small containers are not being recommended either, which will allow the use of high VOC low solids stains for maximum depth of penetration and color uniformity. The EPA case study paper concludes that a close association with coatings manufacturers usually remedies waterborne stain problems satisfactorily, primarily with the addition and optimization of surfactants. Waterborne dye stains are also available which improve color uniformity.

National Technical Systems

During the rule development process in 1998, the District contracted with National Technical Systems (NTS) to obtain additional performance data for zero-, low-, and high-VOC coatings. The study was referred to as the Phase II Assessment Study of Architectural Coatings with an overall objective to analyze the application and durability characteristics of 94 individual coatings and 44 coating systems. The findings of the laboratory testing portion of the study indicated that the zero- and low-VOC products showed similar and in some cases, better performance properties than the high-VOC coatings. Once the laboratory testing of the coatings was completed, an accelerated weathering study of the coating systems, as well as a real-time 24-month exposure test was initiated to analyze the effect of ambient conditions on the paint systems. At the end of the two-year outdoor test, the results continued to show that the zero and low-VOC coatings tested were similar in weathering and durability characteristics and in many cases outperformed the higher-VOC solventborne counterparts.

KTA-Tator

As previously mentioned, Rule 1113 requires a technology assessment for the future VOC limits for nonflats, primers, sealers, and undercoaters; quick-dry primers, sealers, and undercoaters; quick-dry enamels; waterproofing wood sealers; stains; floor; rust preventative; and industrial maintenance coatings as specified in paragraph (c)(2) by July 1, 2001 and July 1, 2005. The District initiated a contract to study various coatings with KTA-Tator, Inc. based on a protocol resulting from discussions with the TAC. The assessment compared high-, low- and zero-VOC formulations for four architectural coating categories: floor coatings, non-flat interior and exterior high gloss paints, interior and exterior primers, sealers and undercoaters and interior stains. The characteristics and performance of 31 coatings on various substrates were studied in the evaluation and District staff considers that the overall results of the study substantiate current and future limits.

Essential Public Service Agencies

Following the May 14, 1999 amendments to Rule 1113, the Board directed staff to provide technical oversight and contribute funding to the Essential Public Service Agency (EPSA) technology assessment. District staff formed a committee in September 1999 comprised of representatives from Metropolitan Water District (MWD), Department of Water Resources, Cal Trans and the Department of Water and Power to conduct a technology assessment for the EPSA's.

The scope of the program is being completed in multiple phases and is designed to test and evaluate VOC compliant coatings necessary for maintenance and new construction projects for agencies essential to the public. Approximately 150 VOC compliant industrial maintenance coating systems have already been applied and are undergoing environmental testing over a three to four year period.

Phase I of the program consists of evaluating immersion and atmospheric coating systems and will be completed by the 2nd quarter of 2004. In addition to testing atmospheric and immersion coatings, Phase II of the program includes the technology assessment of chemical containment and roofing coating systems. The coatings in the second phase are already undergoing environmental testing which should be completed in 2005.

Staff plans to present the results of this study to the industry and the Governing Board upon completion of all testing.

Southern California Alliance of Publicly-Owned Treatment Works (SCAP)

The Southern California Alliance of Publicly Owned Treatment Works (SCAP) is a non-profit corporation organized to help ensure that regulations affecting POTW's are reasonable and in the public's best interest. The 1999 amendment to AQMD Rule 1113 requires lower VOC content limits for industrial maintenance coatings. Almost all of the coatings used by SCAP agencies will be non-compliant with the new VOC limits. As a result, SCAP initiated an independent study in September 2000 to identify low-VOC coating systems suitable for wastewater treatment and conveyance facilities. Participants in this study included the Los Angeles County Sanitation District, the Orange County Sanitation District, the Eastern Municipal Water District, Las Virgenes Municipal Water District and the City of Los Angeles.

The research effort, contracted to KTA-Tator, evaluated the relative performance of these low-VOC atmospheric and immersion coating systems both in laboratory testing and two-year field exposure. The coating systems represented three VOC content ranges: the first group of coatings (<340 g/l to 250 g/l) complies with the current VOC limit in Rule 1113 for industrial maintenance coatings; the second group (<250 g/l to 100 g/l) represents coatings that comply with the January 1, 2004 VOC limits; and the third group of coatings (<100 g/l) meets the July 1, 2006 VOC limits.

A total of 21 industrial protective coating systems were tested. The tests exposed coated test specimens to atmospheric, gas vapor, wastewater immersion and/or ammonia exposure at multiple plant sites for a period of 2 years. Specimens were also subjected to laboratory physical testing, i.e., accelerated corrosion resistance (salt fog), accelerated weathering, abrasion resistance, and impact resistance.

The results of the study, completed in February 2003, indicated that compliant coating systems meeting the performance criteria for wastewater environments, are currently available. In particular, the study concluded that atmospheric coating systems (with VOC content ranging from <250 g/l to 100 g/l) meet the 2004 VOC limit and perform similarly to existing coating systems (<340 g/l to 250 g/l). Additionally, immersion coating systems meeting the 2004 and 2006 VOC limits showed similar performance results

relative to existing coating systems. Atmospheric coating systems with a VOC content below 100 g/l, however, were not readily available for purchase by end-users when the study was conducted. Today, there are more products than there were 3 years ago that may meet the performance criteria and future VOC limits in the rule for industrial maintenance coatings. Staff believes that the overall results presented in the SCAP study continue to support the future VOC limits in Rule 1113.

Rule 1136 Technology Assessment

District staff has reviewed the Technology Assessment for Rule 1136 – Wood Products Coatings completed earlier this year. The results of the technical assessment and the industrial progress reports required under Rule 1136 indicate that the technology exists and is in use today in the form of many resin and solvent systems that are less than 275 g/l of VOCs for application to wood substrates. The significant number of large and small companies that conduct a variety of wood finishing operations that meet the proposed 275 g/l VOC limit for clear wood finishes in Rule 1113 are a strong indication of the feasibility of these low VOC products. Based on discussions with manufacturers who supply products for shop- and field-finishing, staff believes that the products in use in the manufacturing wood products industry (Rule 1136) that are well below 275 g/l VOC can readily be used in field applications (Rule 1113). The complete technological assessment, issued in June 2003, is available for the Board's review in Appendix D of this report.

Future Program Activities and Studies

Over the next year, staff will study all coating categories whose limit will have changed with the anticipated December, 2003 amendments to Rule 1113. In addition, the Technical Advisory Committee has asked staff to study several coating categories in more detail to confirm some of the performance conclusions derived from the technology assessments. Working with this committee and other manufacturers, staff has agreed that high-gloss non-flats, clear wood finishes including varnishes and exterior stains applied to horizontal surfaces are good candidates for further study in 2004 and 2005. The National Paint and Coatings Association has offered to perform further evaluations of various coating categories in conjunction with District efforts to study performance and long term durability of low and ultra low VOC coatings. Additionally, the District will continue previous discussions with the TAC concerning the use of other architectural coating evaluation facilities such as the Master Painters Institute (MPI), a group founded to develop performance-based standards in conjunction with paint manufacturers and paint technologists.

In addition to these technology assessments, staff will be involved in the following activities over the next year:

1. Sales records and field compliance audits of the Phase II Averaging Compliance Plans;
2. Holding quarterly meetings of the Technical Advisory Committee and Working Group;

3. Continuing evaluation of the 2001 CARB Architectural Coatings survey of year 2000 coating characteristics;
4. Updates of zero- and low-VOC product availability lists;
5. Review of results of studies underway by Essential Public Service Agencies on performance of industrial maintenance coatings;
6. Continuing field audits and contractor surveys of in-use applications of all coatings with future compliance dates in Rule 1113, and
7. Working with wood product and other coating manufacturers to identify coatings for laboratory testing and field applications.

The next Annual Report will be presented to the Governing Board in December of 2004.

Recommendation

Previous amendments to Rule 1113 have included VOC reductions in coating categories that have been the focus of many meetings with the public and have been targeted for specific coating performance characteristic studies by different agencies and testing companies. Although those specific categories have been the subject of review, new information on other categories that District staff has assessed show that major VOC reductions can also be achieved in areas not previously considered. The emphasis of this report has been to assimilate all the data available and make appropriate recommendations.

As surveys, studies and technical data research has substantiated, the list of viable compliant and supercompliant coatings continues to grow and share a significantly increasing penetration of the architectural coatings market. The District's research of technical information through coating studies, assessments of sales data, marketing brochures, Material Safety Data Sheets and other sources continue to support staff's conviction that there are a substantial number of ultra-low VOC products available that meet future proposed limits. Those same coatings are being used and meet or exceed expected performance characteristics for many different substrates in various environmental conditions. Consequently, it is recommended that the Board adopt new proposed amendments to specific coating categories and maintain current and future VOC limits for all other categories as stipulated in the rule.

Appendices

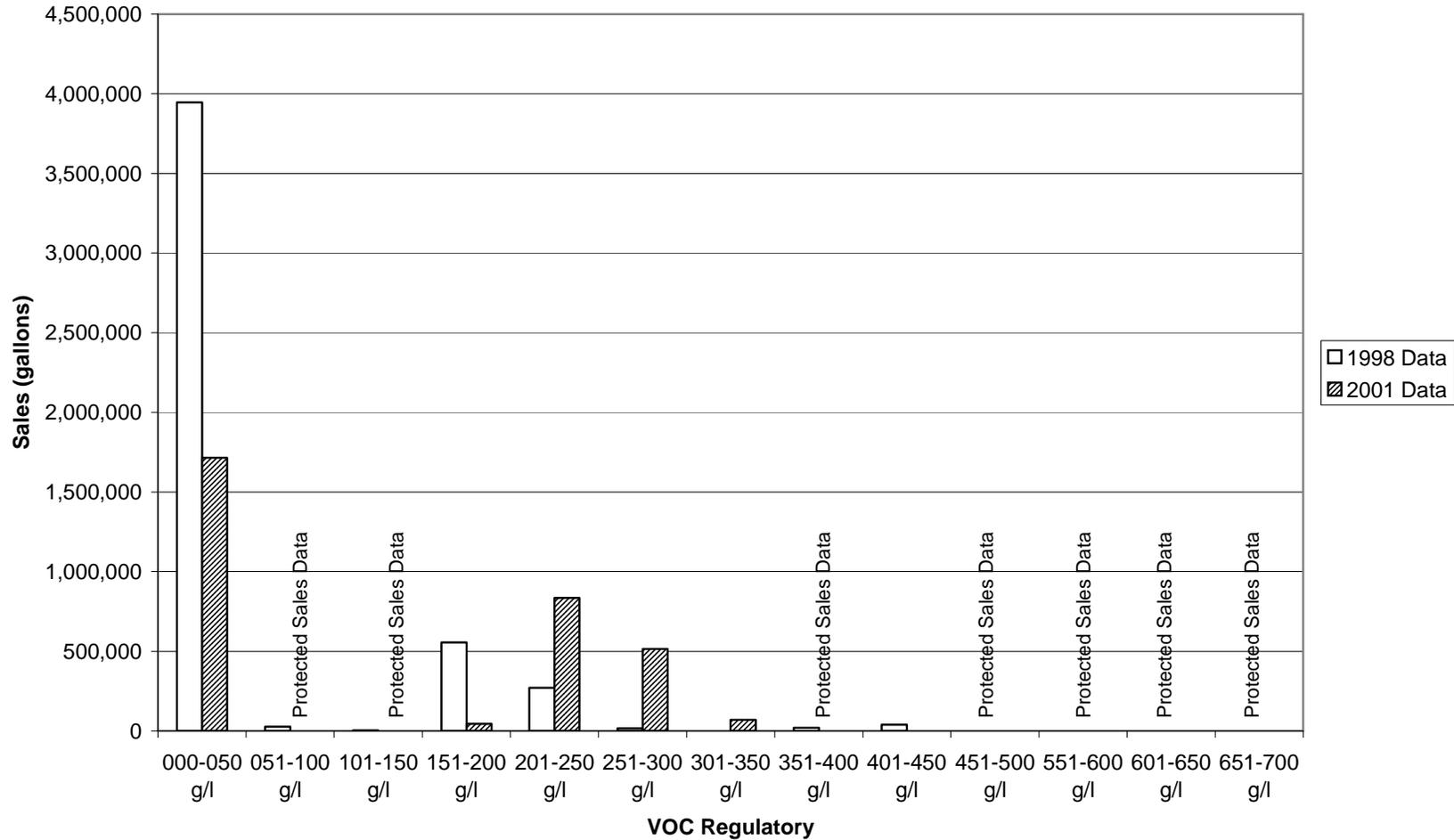
- A. Statewide Sales Trends
- B. Coatings Analysis
- C. AVES Study
- D. Technology Assessment for Rule 1136 – Wood Products Coatings
- E. Comment Letters Received and Response to Comments

APPENDIX A

STATEWIDE SALES TRENDS

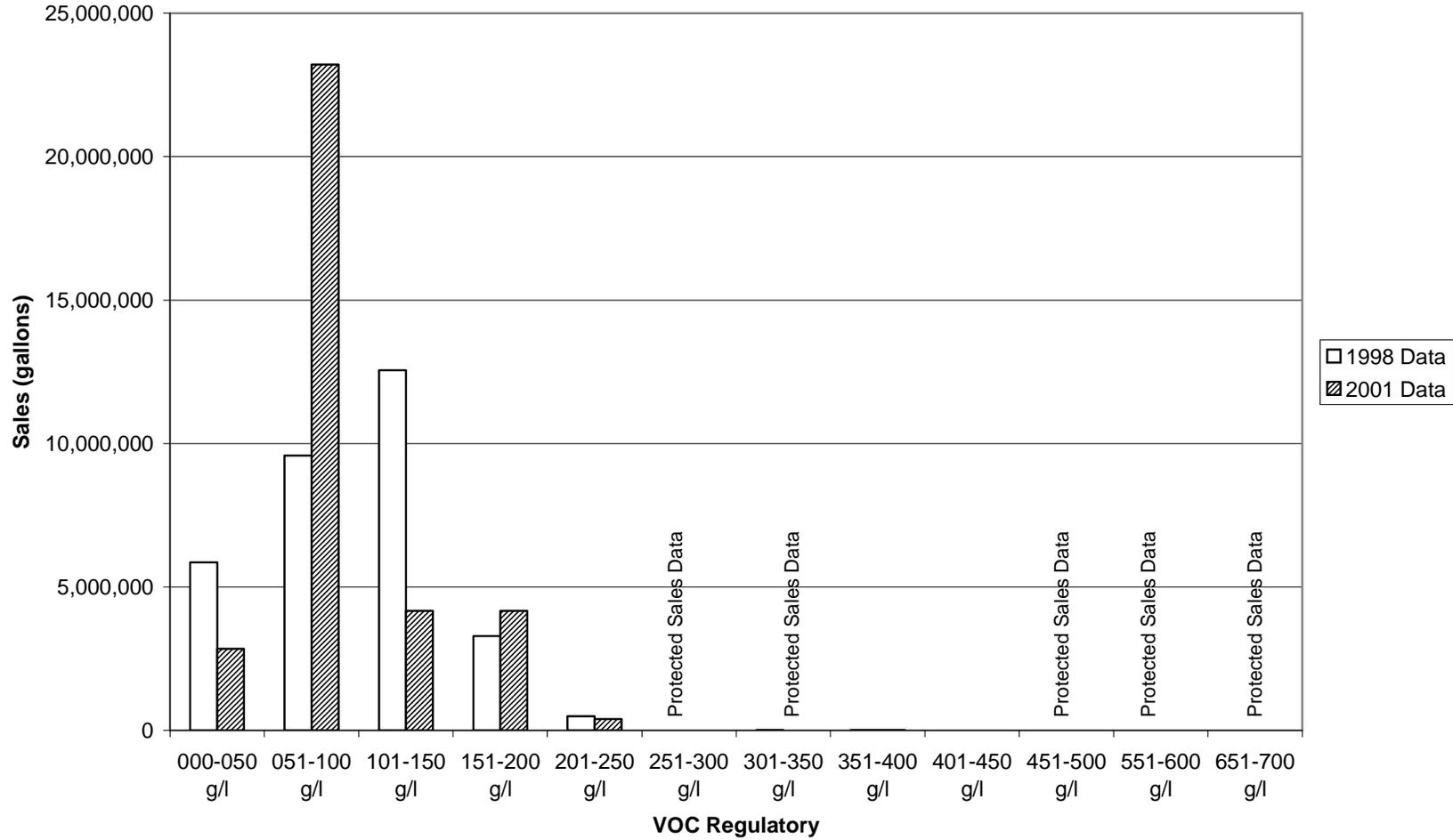
COMPARISON OF 1998 & 2001 CARB ARCHITECTURAL COATING SURVEYS

**ARB Architectural Coating Survey - Statewide Sales Trends (including quarts):
Bituminous Roof Coating**

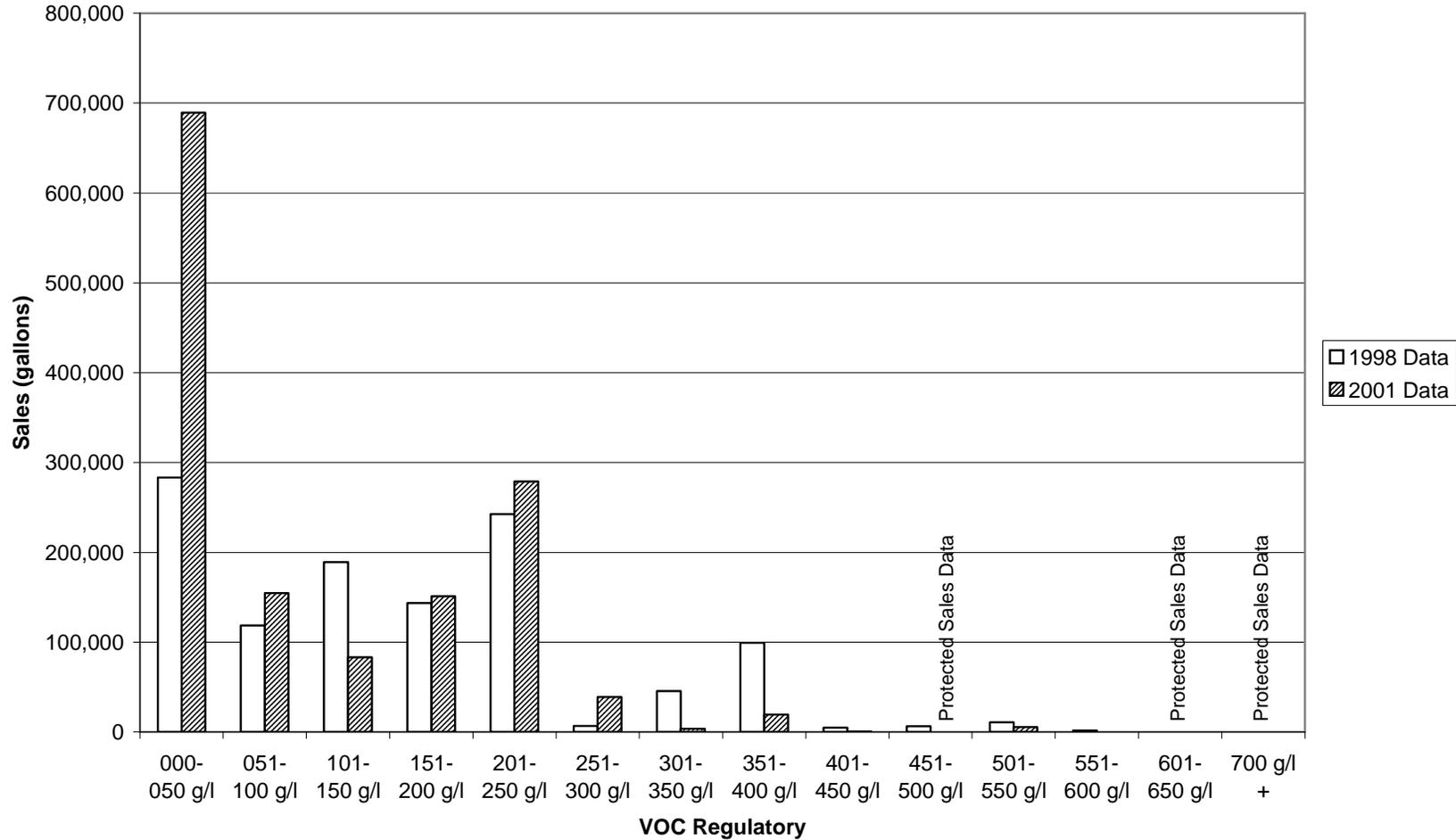


For the VOC range of 0-50 g/l, the large difference in sales is probably due to the fact that Driveway Sealers were reported under the "Bituminous" category in 1998, but they were reported under the "Other" category for the 2001 survey.

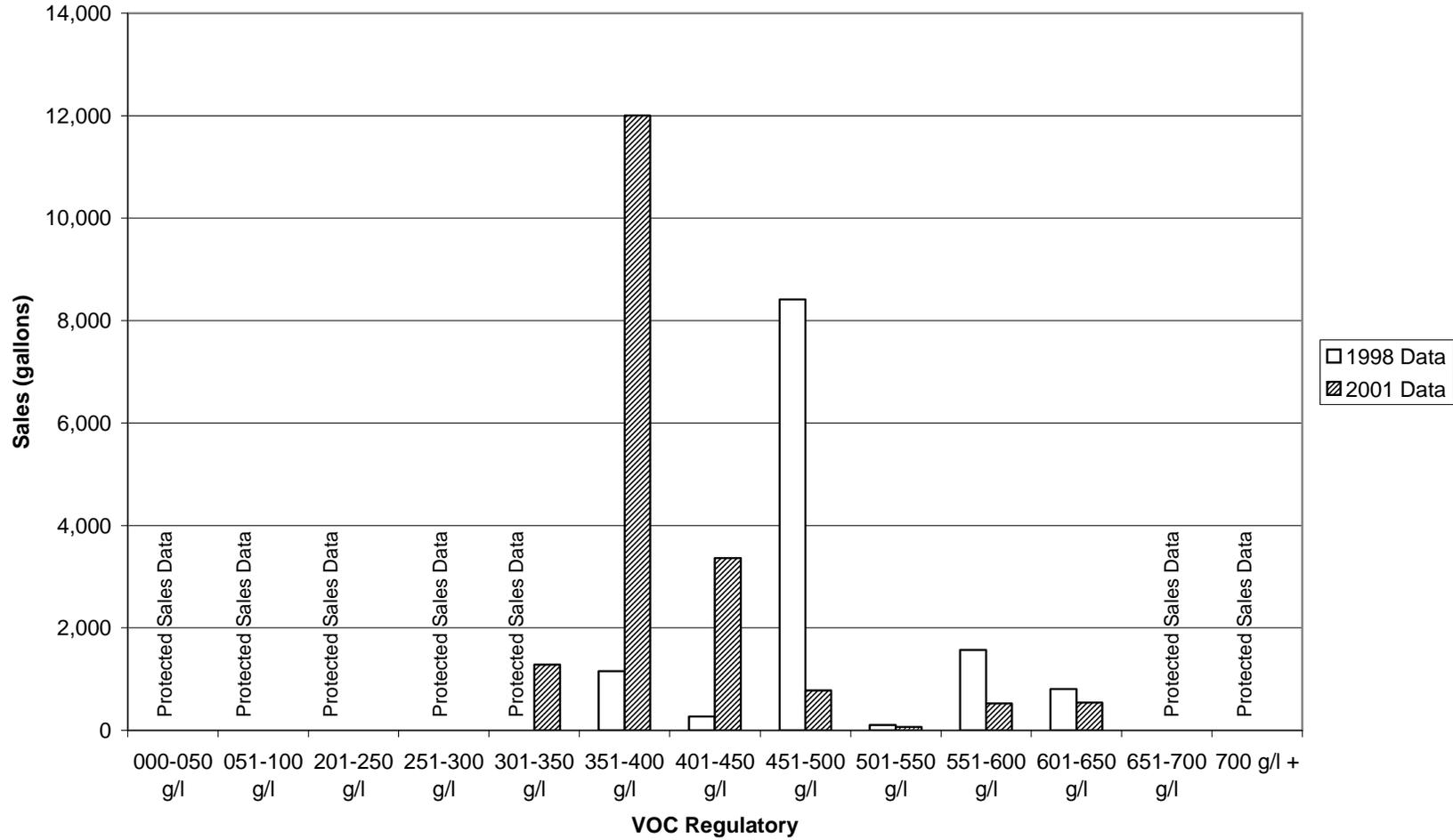
**ARB Architectural Coating Survey - Statewide Sales Trends (including quarts):
Flat Coating**



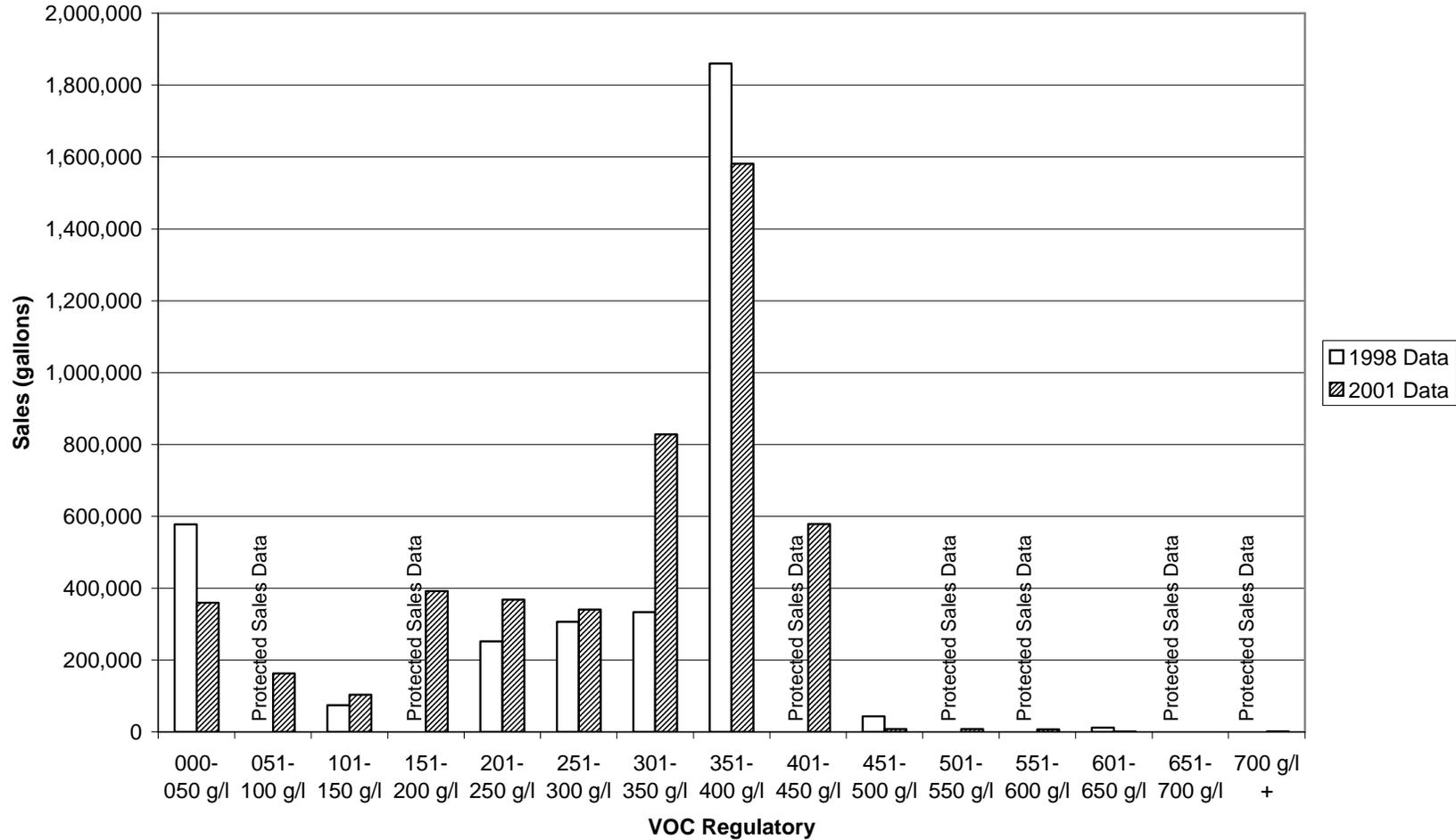
**ARB Architectural Coating Survey - Statewide Sales Trends (including quarts):
Floor Coating**



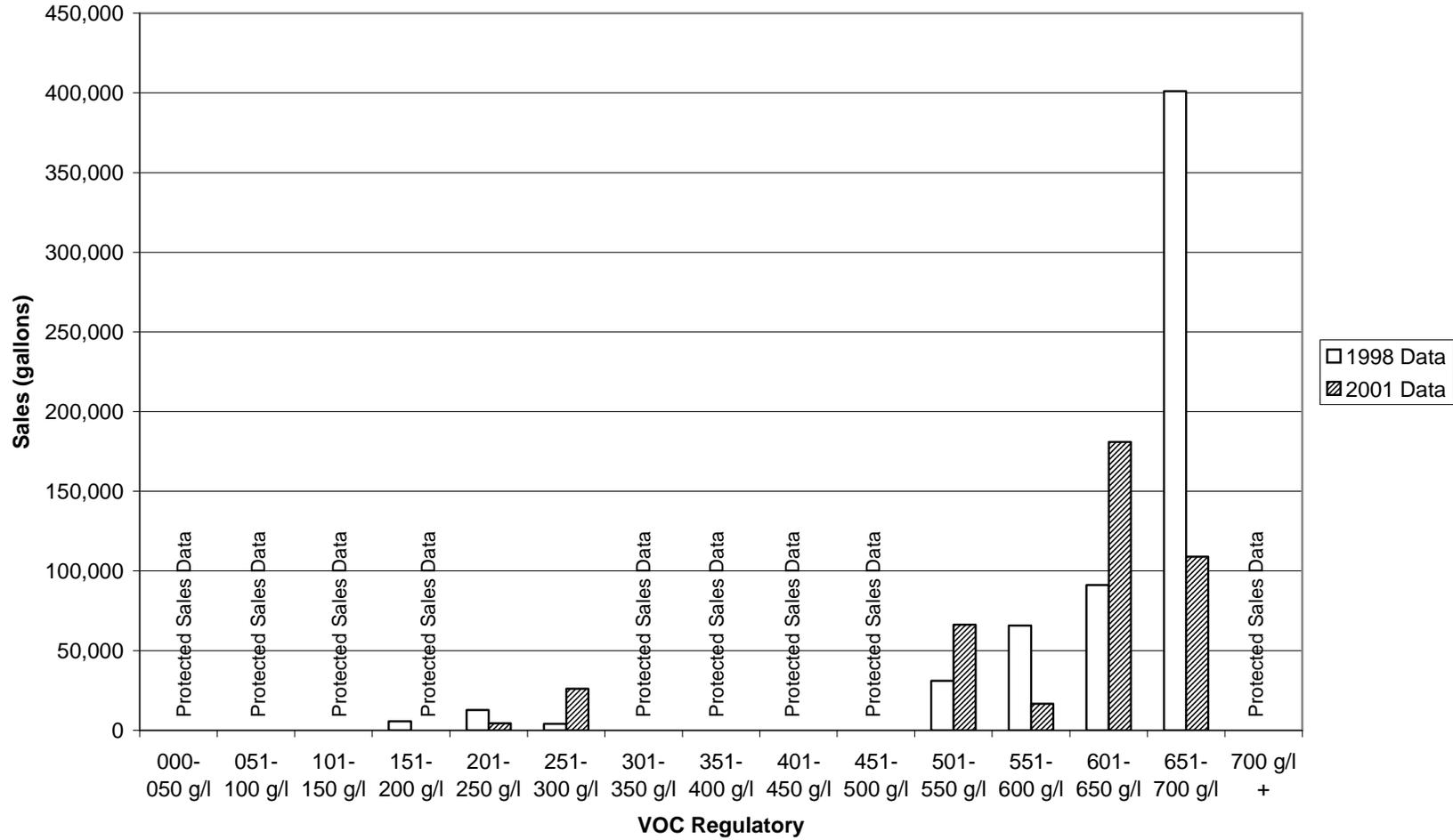
**ARB Architectural Coating Survey - Statewide Sales Trends (including quarts):
High Temperature Coating**



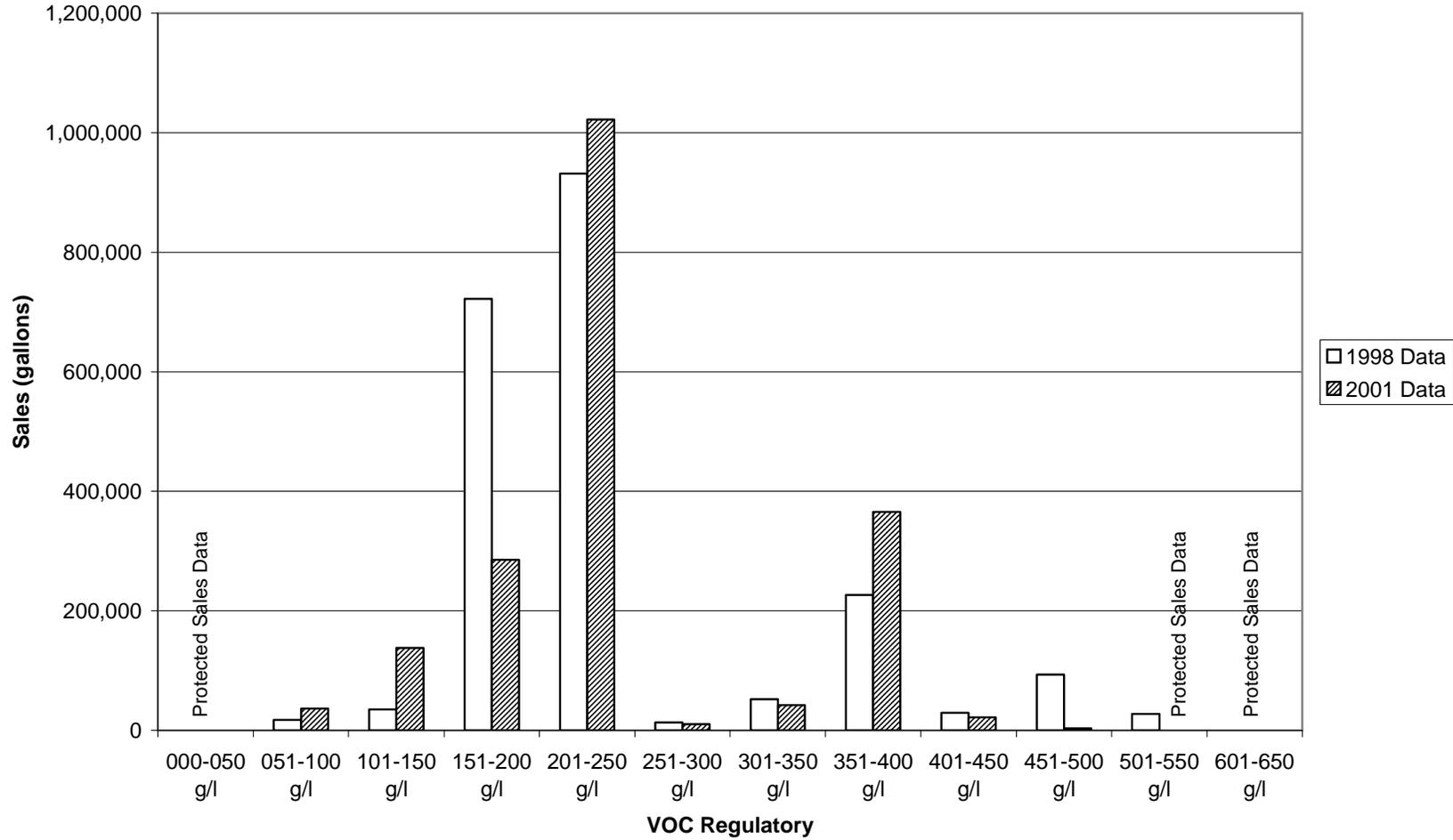
**ARB Architectural Coating Survey - Statewide Sales Trends (including quarts):
Industrial Maintenance Coating**



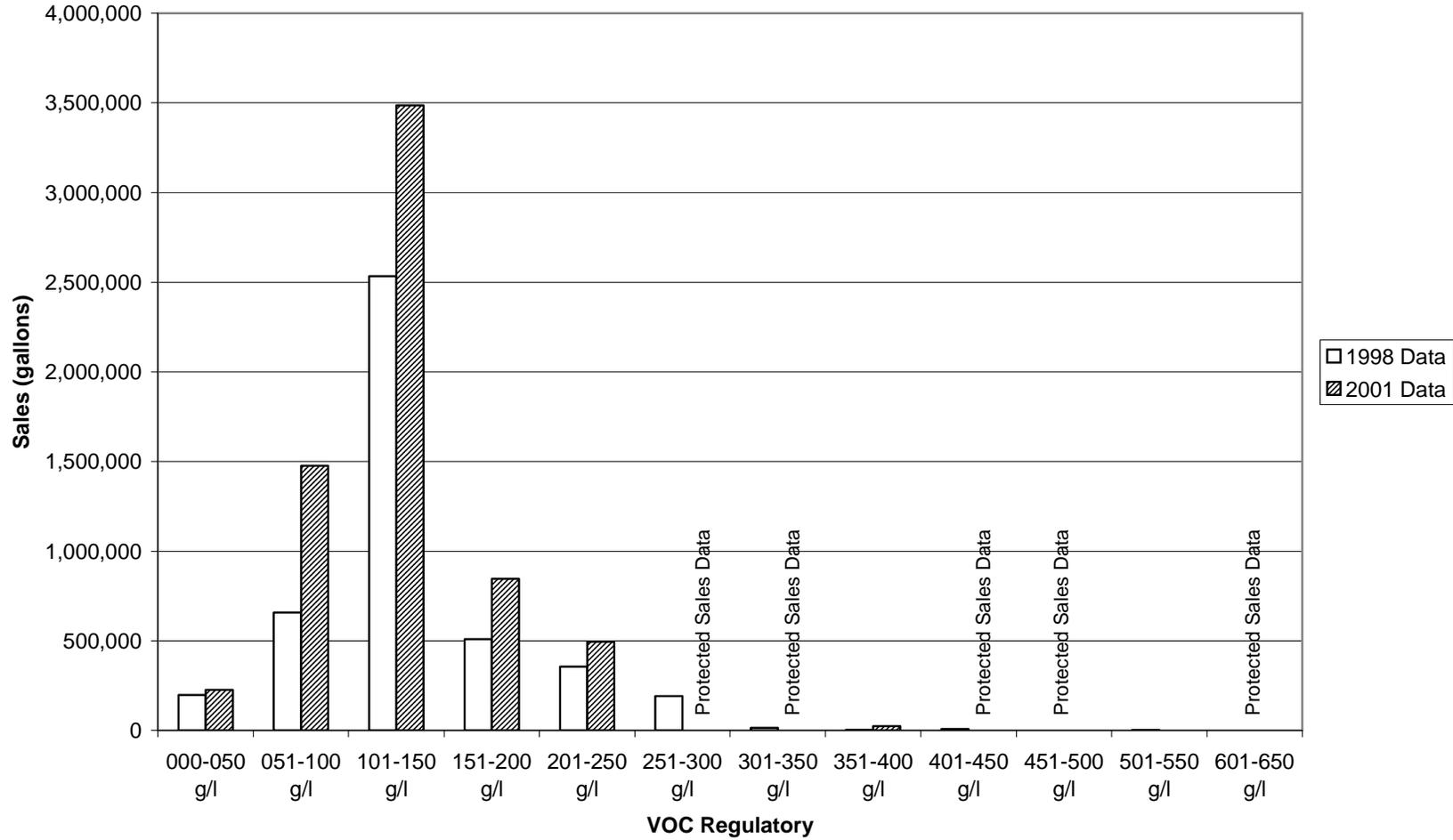
**ARB Architectural Coating Survey - Statewide Sales Trends (including quarts):
Lacquers**



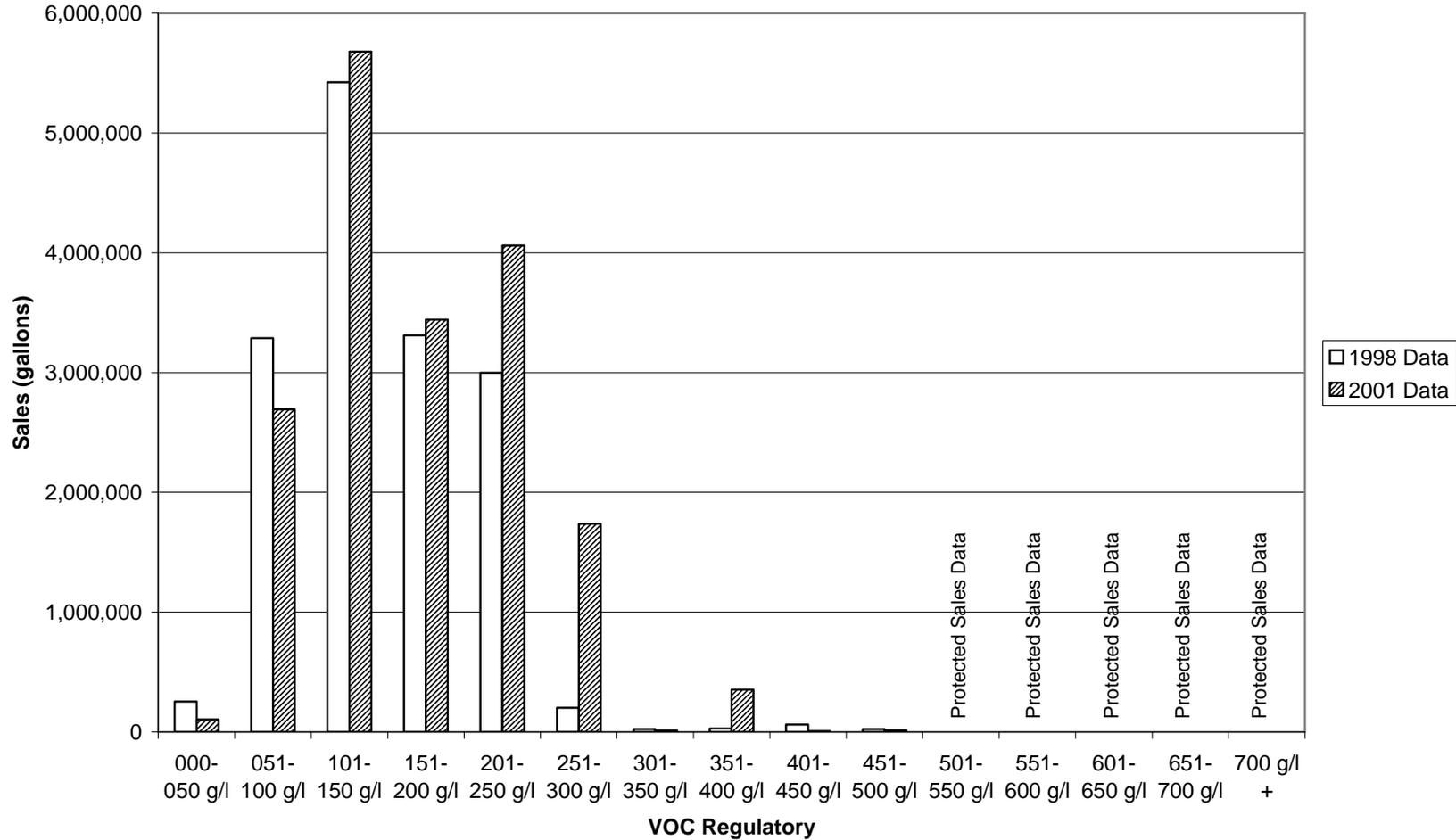
**ARB Architectural Coating Survey - Statewide Sales Trends (including quarts):
Nonflat - High Gloss**



**ARB Architectural Coating Survey - Statewide Sales Trends (including quarts):
Nonflat - Low Gloss**

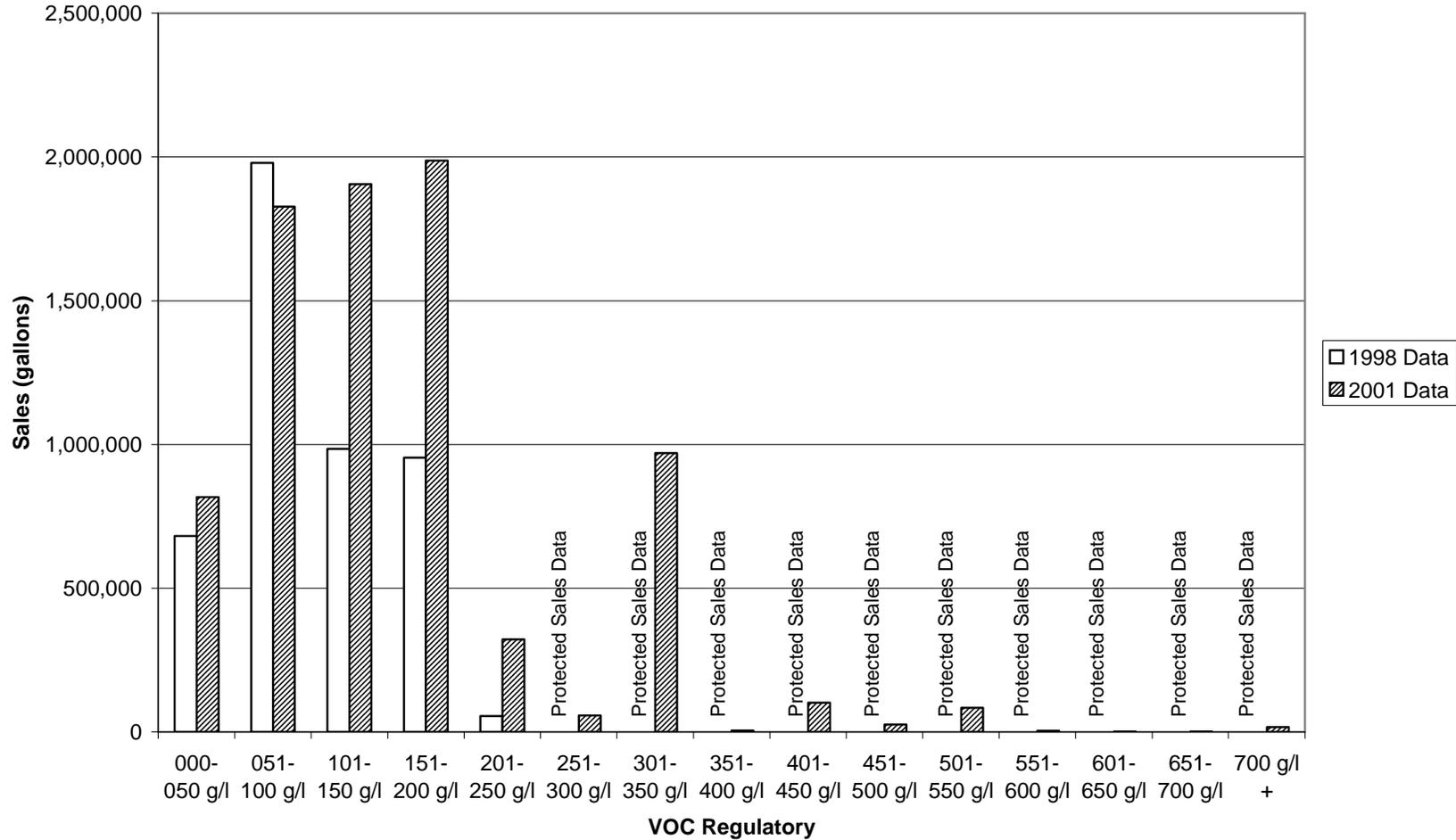


**ARB Architectural Coating Survey - Statewide Sales Trends (including quarts):
Nonflat - Medium Gloss**

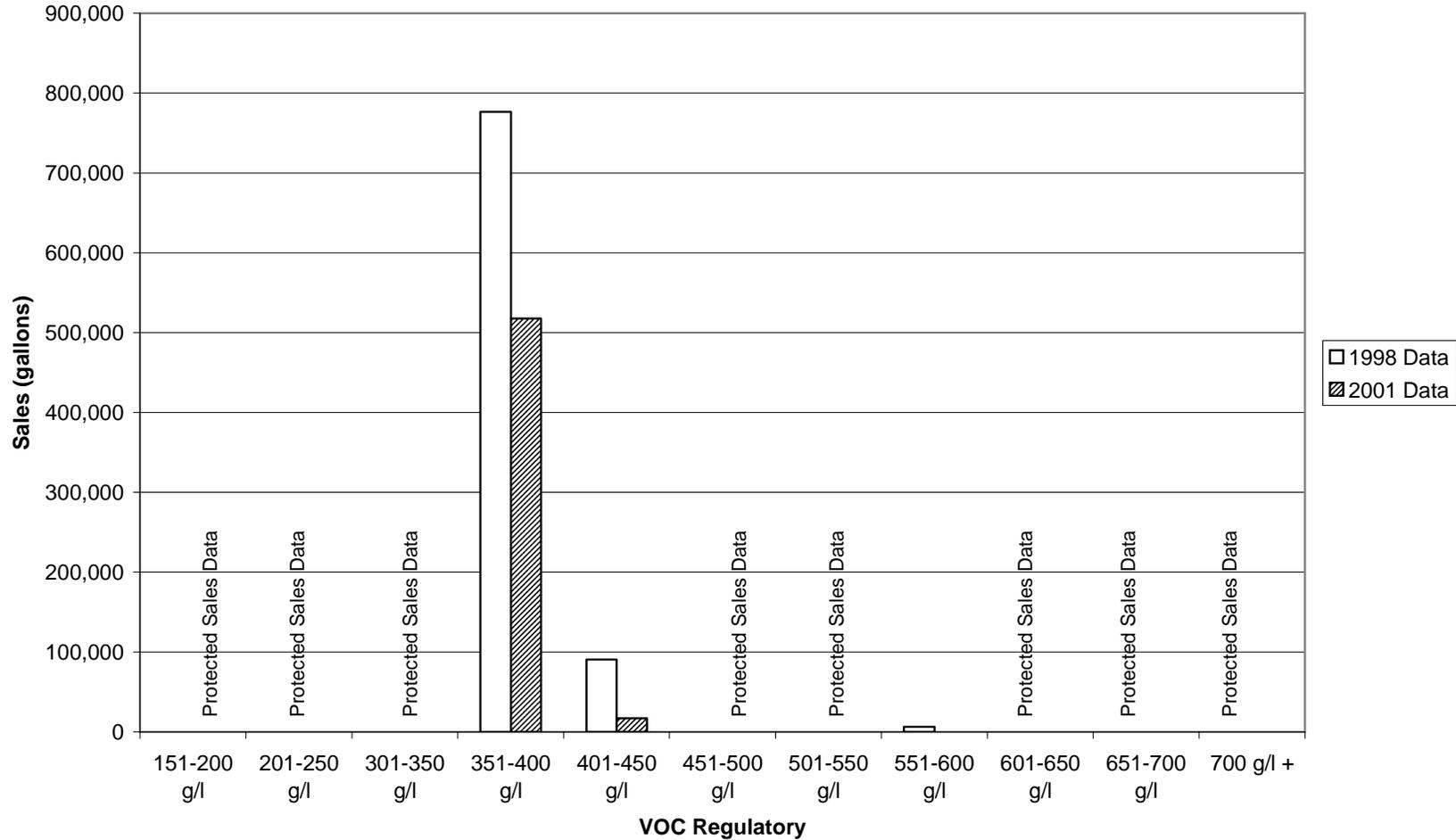


For the 2001 survey, four of the top six manufacturers in the Nonflat - Medium Gloss category reported increases in their sales-weighted average VOC values, as compared to the data reported in 1998.

**ARB Architectural Coating Survey - Statewide Sales Trends (including quarts):
Primer, Sealer, and Undercoater**

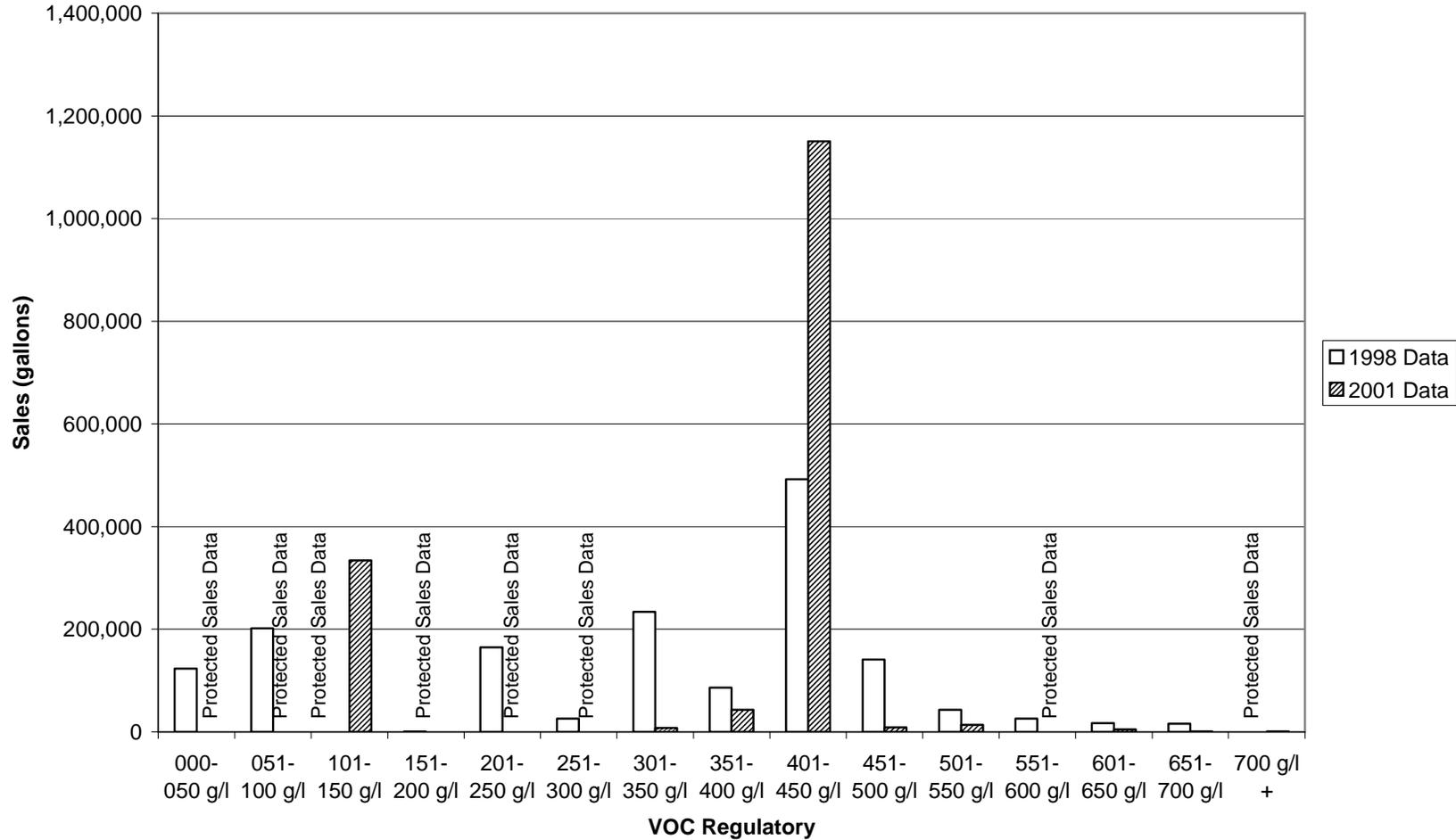


ARB Architectural Coating Survey - Statewide Sales Trends (including quarts): Quick Dry Enamel



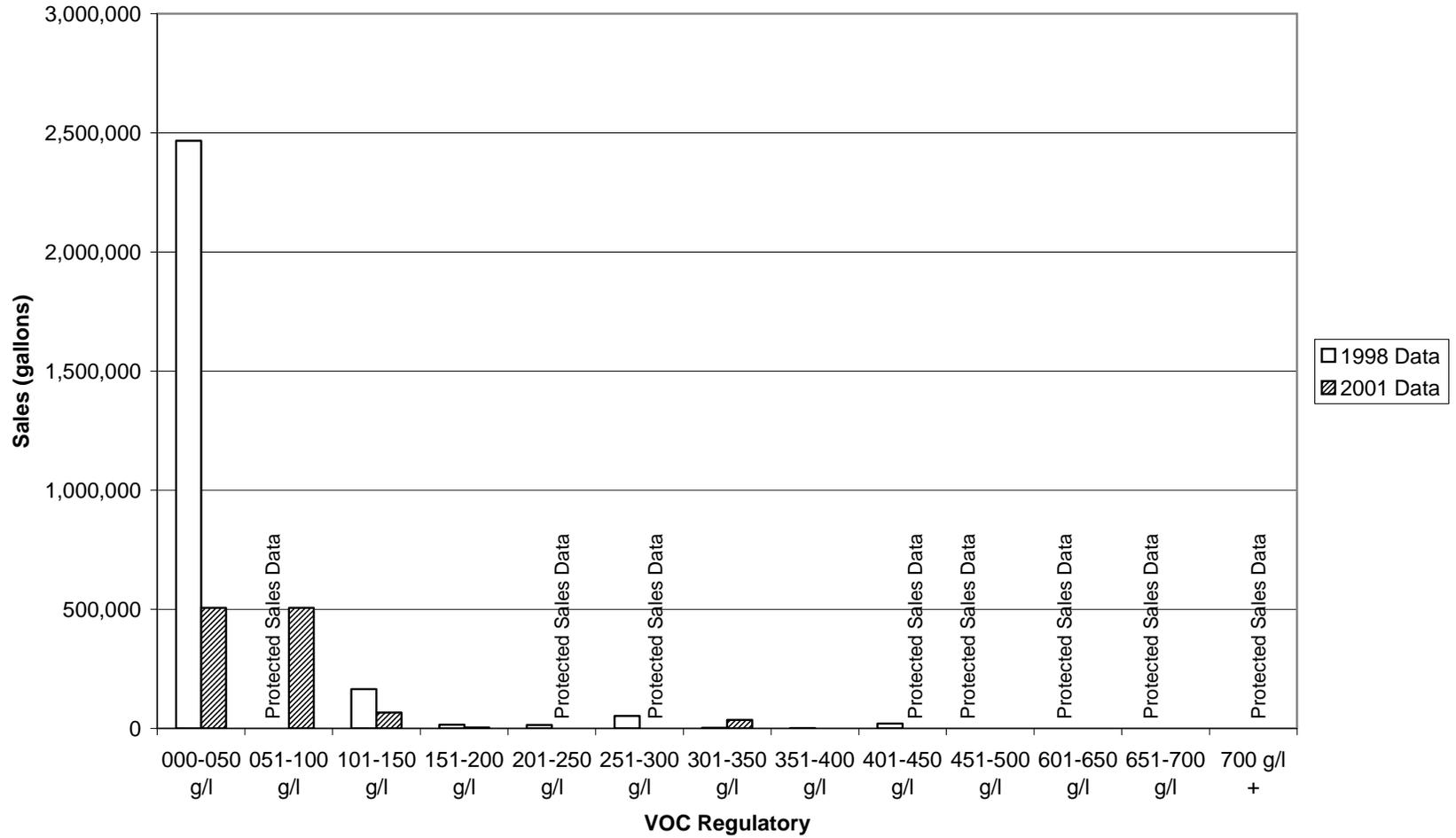
For the VOC range of 351-400 g/l, the difference in sales is probably due to the fact that the 2001 survey gathered additional data that allowed us to improve our QA/QC and re-classify coatings that did not meet the Quick Dry Enamel criteria.

**ARB Architectural Coating Survey - Statewide Sales Trends (including quarts):
Quick Dry Primer, Sealer, Undercoater**

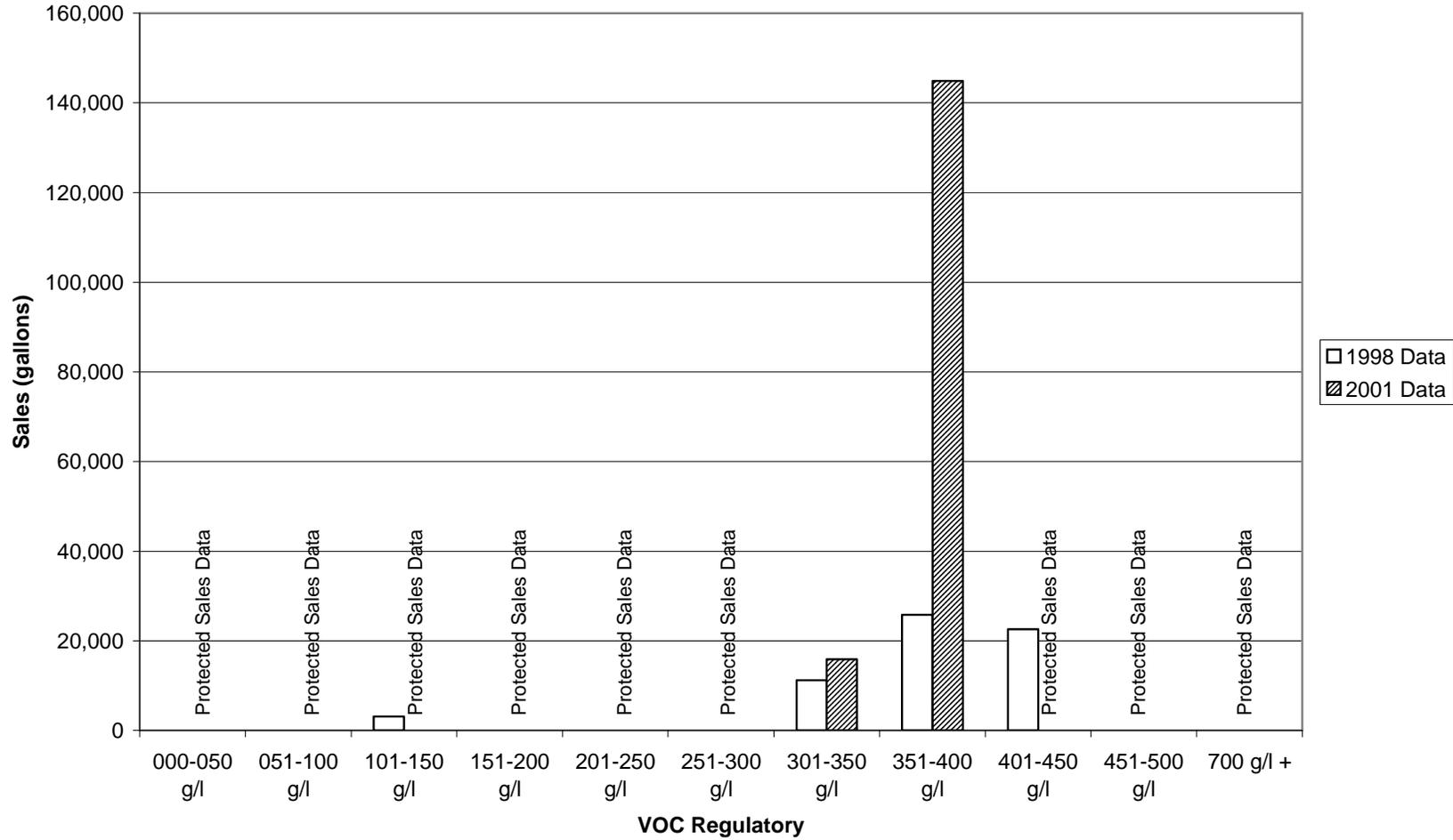


In the 1998 survey, the largest manufacturer in this category reported mostly waterborne QDPSUs. In the 2001 survey, this manufacturer reported primarily solventborne QDPSUs.

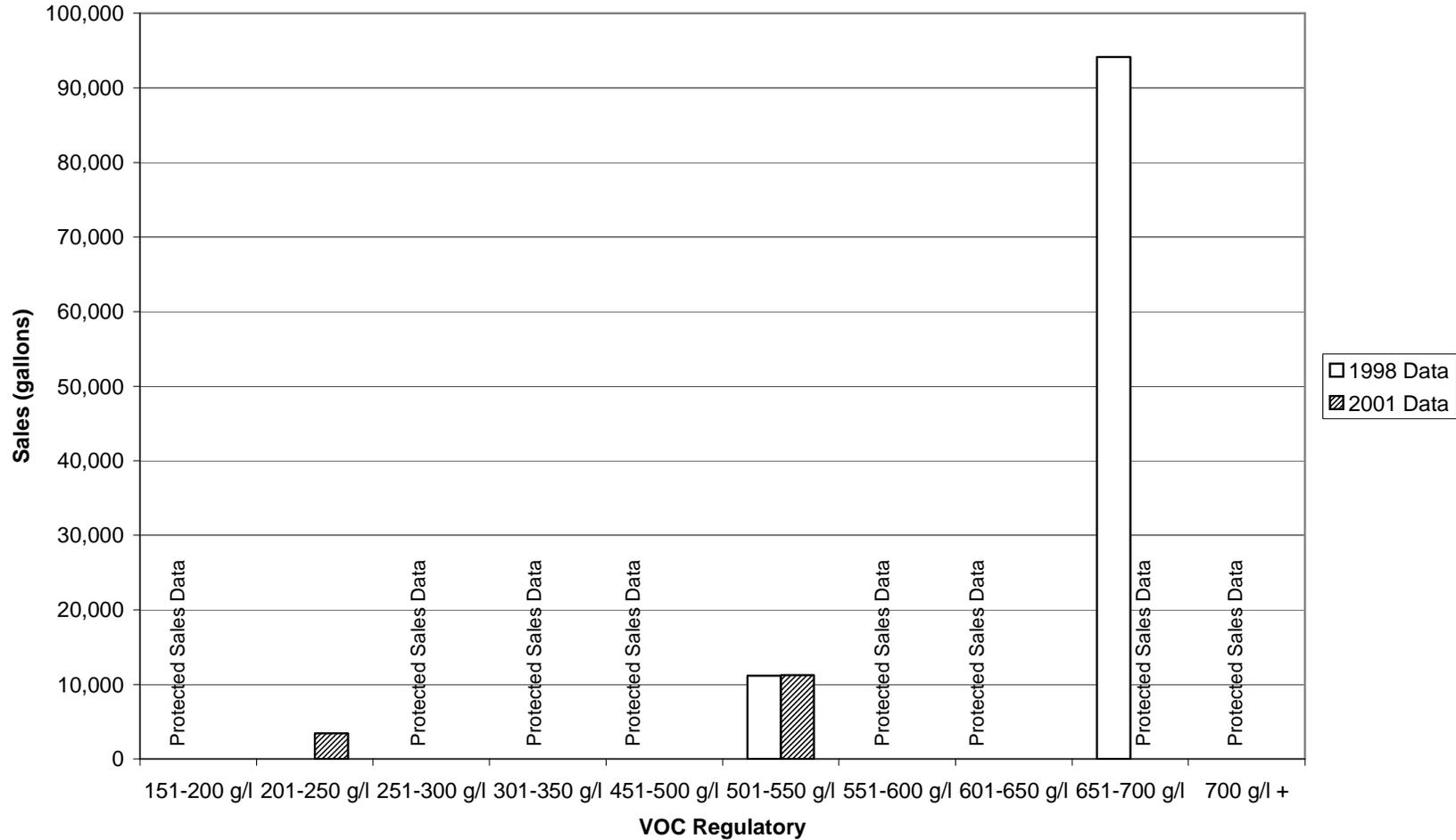
**ARB Architectural Coating Survey - Statewide Sales Trends (including quarts):
Roof Coating**



**ARB Architectural Coating Survey - Statewide Sales Trends (including quarts):
Rust Preventive Coating**

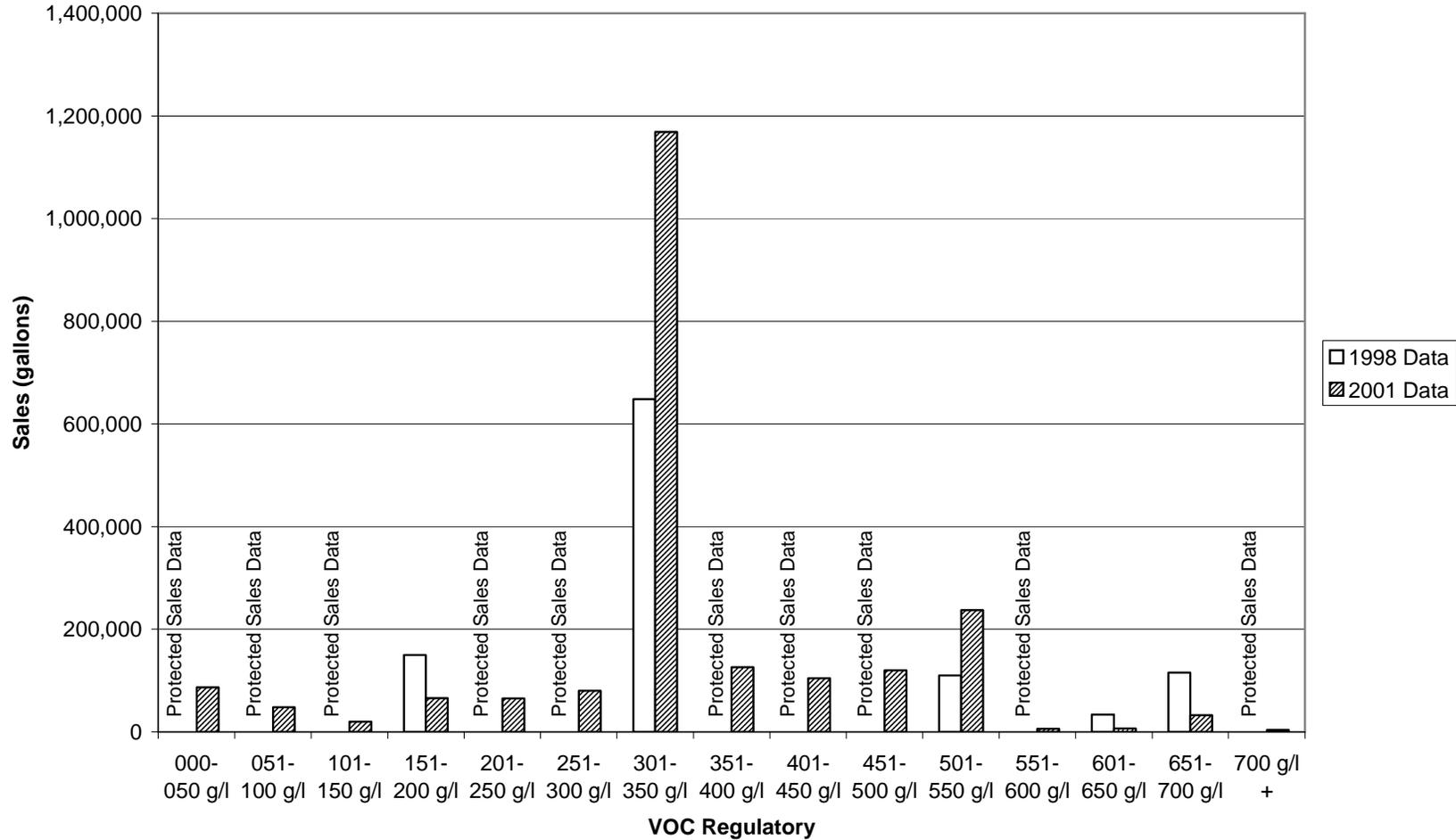


**ARB Architectural Coating Survey - Statewide Sales Trends (including quarts):
Sanding Sealers**



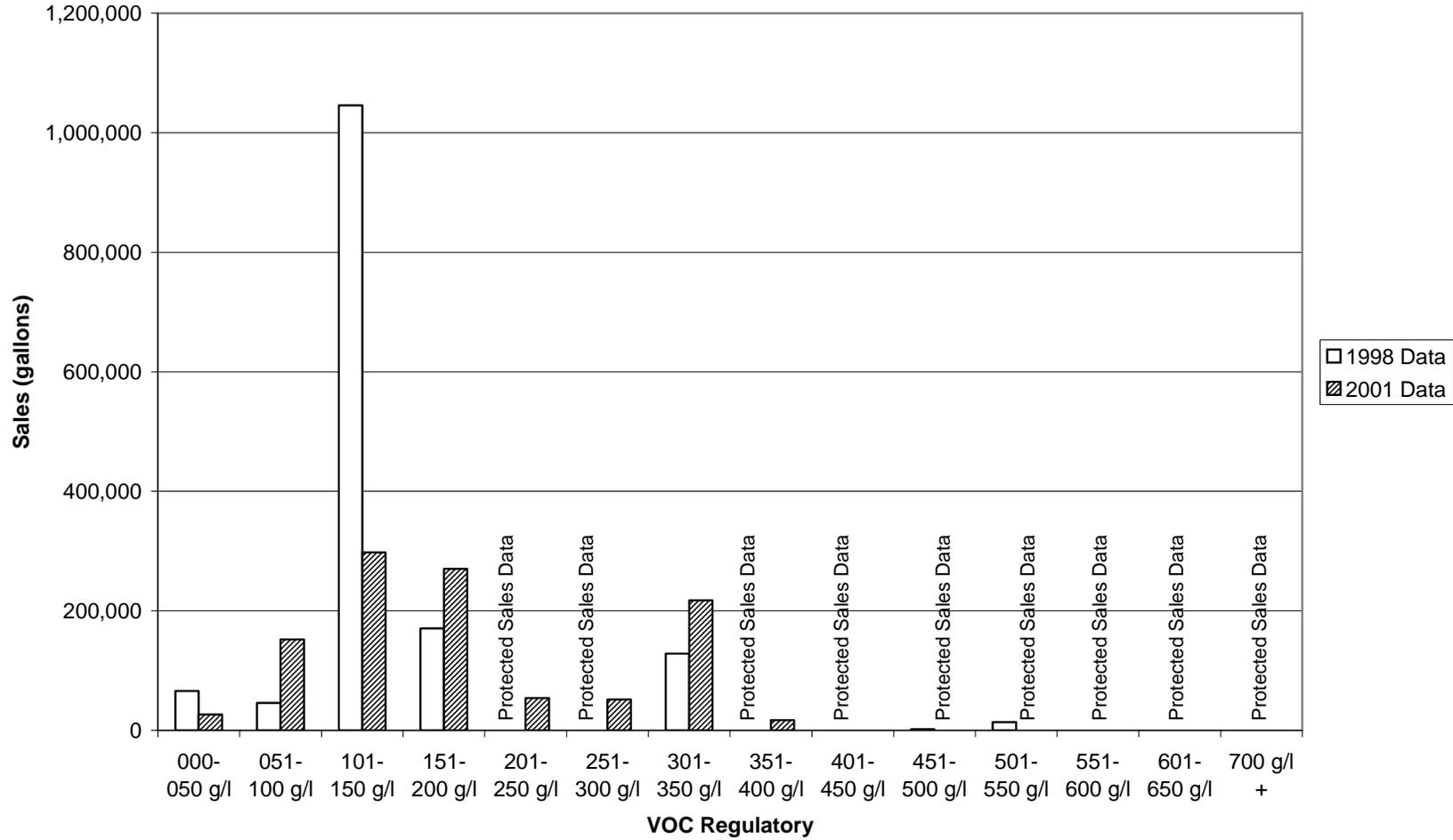
In the 1998 survey, some manufacturers may have reported Lacquer Sanding Sealers in the Sanding Sealer category, rather than in the Lacquers category which is the correct classification.

**ARB Architectural Coating Survey - Statewide Sales Trends (including quarts):
Stains - Clear/Semitransparent**

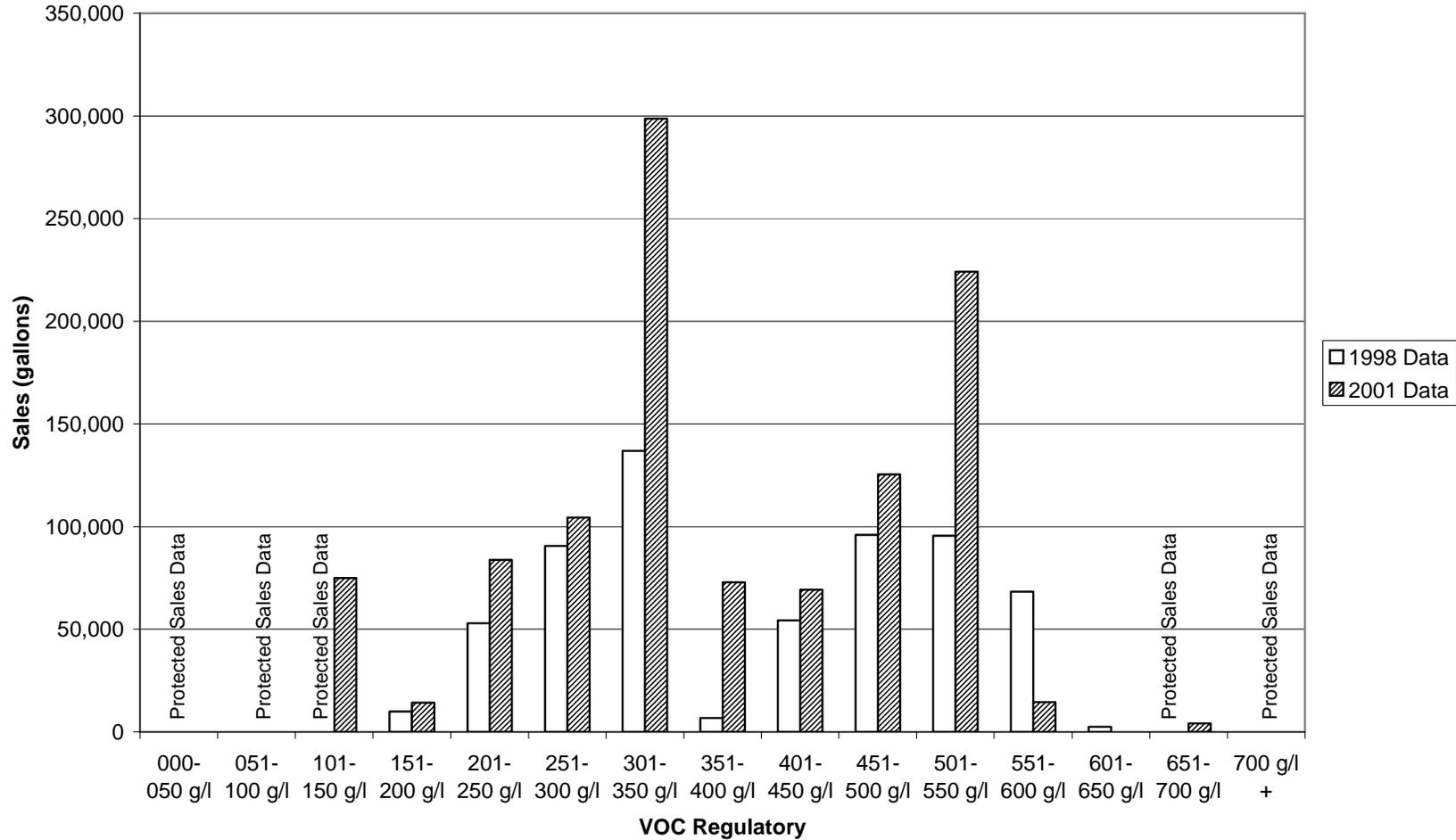


In the 2001 survey, there was an increase in sales of non-complying, solvent-borne, clear/semitransparent stains. This was due to increasing sales of previously reported non-complying products, and the introduction of new non-complying products.

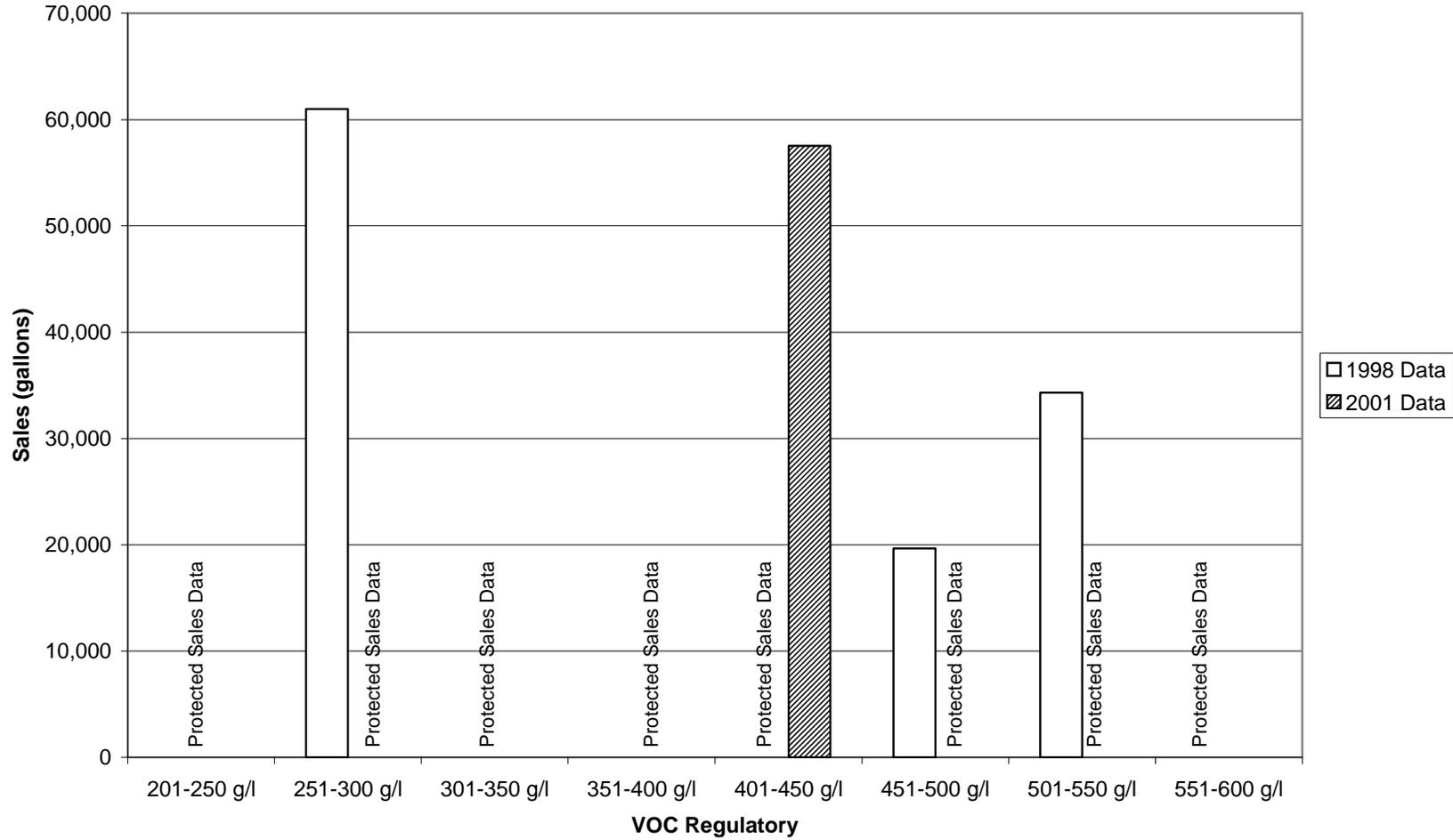
**ARB Architectural Coating Survey - Statewide Sales Trends (including quarts):
Stains - Opaque**



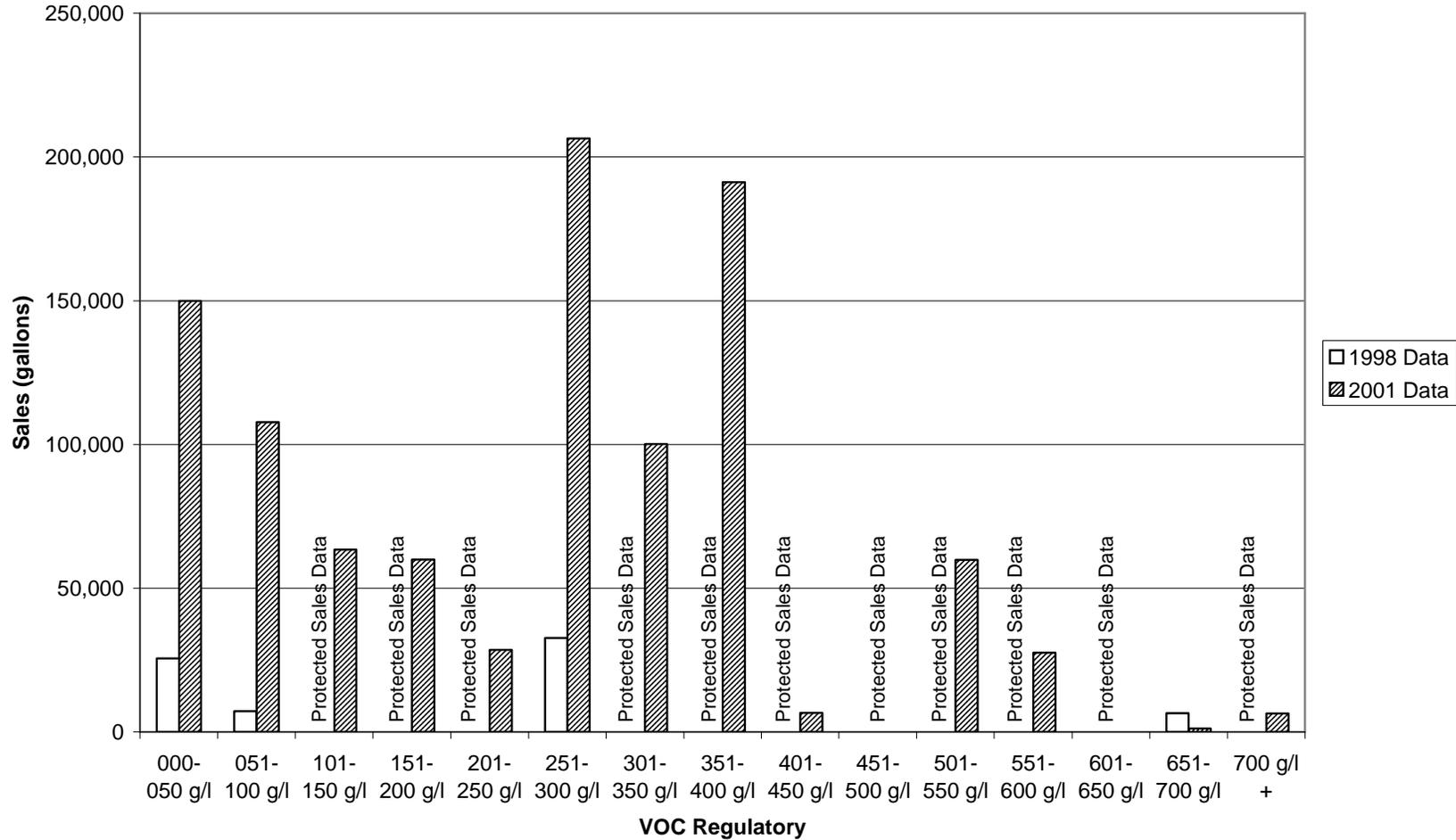
**ARB Architectural Coating Survey - Statewide Sales Trends (including quarts):
Varnishes - Clear**



**ARB Architectural Coating Survey - Statewide Sales Trends (including quarts):
Varnishes - Semitransparent**



ARB Architectural Coating Survey - Statewide Sales Trends (including quarts): Waterproofing Sealers



APPENDIX B

COATINGS ANALYSIS

CFW Varnish
350 g/l and less
Samples 58

Coating Company, Product Name, Components	Interior Exterior	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal)	Recommended substrate/ exposure	Coating Characteristics	Drying time
BonaKemi, BonaTech Traffic	I	350	34	N/A	Commercial/institutional/residential hardwood floors	Durable, nonflammable, fast-drying, abrasion resistant	2-3 hrs
Deft, Deftane Polyurethane Varnish	I/E	350	44	500-600 @ 3 mil	Furniture, floors, doors, cabinets	N/A	1 hr touch, 8-10 hrs recoat
Valspar (McCloskey), Man O' War Marine Spar Varnish 6501	E	350	56	450-550 @ 3 mils	Wood doors, trim, window sills, outdoor furniture, railings, wooden boats	UV resistant, resists cracking, peeling	8-10 hrs touch, 24 hrs recoat
Valspar (McCloskey), Heirloom Stain and Finish	I	350	27	400-500	Furniture, cabinets, doors, paneling, trim	Full brushability, heavy film build	30 min touch 1-2 hrs recoat
Vista Paints, 105 Gloss Varnish	I/E	336	56	400-500	Doors, trim, furniture, cabinets	Durable, water stain resistant	4 hrs touch 24 hrs recoat
Griggs Paint, TT-V-119D Spar Varnish	E	334	N/A	N/A	Wood surfaces	Water, mildew resistant	8 hours
Multi-Clean, Final Floor	I	340	28	800-1,000	Wood floors	Tough, scuff/mark resistant	2 hrs recoat
Spectra Tone (Yukon Finishes), Wood Shield Film Forming Gloss Finish #2650	E	313	61	200-250	Cedar, redwood, log & timber homes, wood sidings, fences	UV, water, mildew resistant, resists cracking, peeling	6 hrs touch, 24 hrs recoat
J.E. Mosers, Waterborne Urethane Finish	I/E	296	N/A	300-500	Floors, bar tops, doors, windows	Durable, non-yellowing, UV resistant, high wear resistance, fast drying	N/A
BEHR, Crystal Clear Hi-Gloss W/B Polyurethane 620, 625, 630	I/E	280-283	N/A	400	Floors, table tops, cabinets, furniture, doors	Durable, long lasting clear finish, non-yellowing	1 hr touch, 3-4 hrs recoat
Diamond Vogel Paints, H2O Acrylic Polyurethane Varnish	I	280	29	232-464	Wood floors, cabinets, doors, furniture	Fast dry, water reducible, resists yellowing	15 min. touch, 1-2 hrs recoat
Glitsa American, Infinity Satin, Semigloss, Gloss	I	278	35	400-500	Wood floors	Scuff and scratch resistant, durable	1 hr touch 2.5 hrs set
Hillyard Inc., Tip-Off Gym Finish	I	275	N/A	500-700	Gym floors	Fast dry	1 hr touch 4 hrs recoat
Benjamin Moore, Benwood Stays Clear Acrylic Polyurethane Low Lustre 423	I	273	28	350-450 @ 4 mil	Interior wood surfaces including floors	Clear, durable, non-yellowing, low odor	1 hr touch 2-3 hrs recoat
Vista Paint, 108 Acrithane High Gloss	I	267	29	400-500	Woodwork, cabinets, furniture, paneling	Outstanding water & chemical resistance	30 min touch 2 hrs recoat
Vista Paint, 109 Acrithane Semi Gloss	I	266	28	400-500	Woodwork, cabinets, furniture, paneling	Outstanding water & chemical resistance	30 min touch 2 hrs recoat
Diamond Vogel Paints, Old Masters H2O Acrylic Varnish	I	252	31	248-489	Bare and previously finished wood surfaces	Fast drying, water reducible, non-yellowing	10 min touch 1 hr recoat
Valspar (McCloskey), Heirloom Crystal Clear Polyurethane	I	260	25	400-500	Floors, stairs, furniture, cabinets, trim and crafts	Durable, clear finish, heavy film build, non yellowing	30 min touch 1-2 hrs recoat
Valspar (McCloskey), Clear Coat	I/E	250	27	400	Cabinets, furniture, walls, entry doors	Scrubable, stain, grease, fingerprint resistant	1 hr touch 4 hrs recoat
BonaKemi, Tech Mega Floor Finish	I	250	33	500-600	Interior residential & commercial floors	Fast drying, non flammable	2-3 hours
Valspar, Duramax Clear Protector 93701	I/E	250	31	400	Wood, fiberglass, wallboard, metal, concrete, masonry	Scrubable, stain, grease, oil resistant	1 hr touch 4 hr recoat
Behr, Premium Plus With Style Crystal Clear 780	I	249	N/A	300-400	Smooth bare wood surfaces	long lasting, non-yellowing, moisture, wear resistant	1 hr touch 2-3 hrs recoat
Behr, Deck Plus Wood-Toned Waterproofing Wood Finish 400	E	247	N/A	250-300	Unsealed wood, decks, siding, fences, furniture	Provides protection against stains, household chemicals and UV rays	24 hours
Minuteman Intl. (Multi-Clean), Pro-Floor 100	I	236	30	900	Wood gym floors	Durable, resilient, resists scratching, scuffing	3 hrs
Zinsser (Carver Tripp), Safe and Simple Super Poly satin, semigloss, gloss	I/E	235-249	N/A		Hardwood floors, doors, table tops, counter tops	Nonflammable, non-yellowing, resists high traffic and heavy wear	30 min
Van Technologies Inc., VanAqua-285 Water Based Wood Topcoat	I	228	N/A	N/A	N/A	Quality topcoat, fast drying	15-30 in

Columbia, Clear Acrylic Urethane Gloss 10-670	I	224	32	320-400	Cabinets, paneling, molding, furniture	Tough, water & alcohol resistant	30-60 min.
Van Technologies Inc., VanEx 680 Exterior Wood Topcoat	E	222	N/A	N/A	Exterior wood surfaces	Flexible, water resistant, good adhesion	24 hrs recoat
Minuteman Intl. (Multi-Clean), Final Floor	I	220	30	800-1000	Hardwood floors	Hard, durable, scuff/mark resistant	2 hrs
Columbia, Clear Acrylic Urethane Flat 10-678	I	212	32	360	Cabinets, paneling, molding, furniture	Tough, water & alcohol resistant, exceptional flow	30-60 min.
Manufacturing & Consulting Chemists, Inc., WCX High Solid Clear Gloss Topcoat, WCX1080- HS	I	210	33	300	Interior wood surfaces	Excellent abrasion, mar resistant, fast drying	30 min touch, 1 hr recoat
J.E. Mosers, Woodworkers Supply Premium Spray Lacquer	I	200	N/A	N/A	Wood surfaces	Extremely durable, highly chemical resistant	N/A
Ronan Paints, Vinyl Cote Flat	I/E	197		400 @ 3 mil	Wood, metal, glass, plastic	Weather resistant, good adhesion, non-yellowing	1 hr touch 2.5 hrs recoat
ICI Paints (ICI Dulux), Woodpride Waterborne Aquacrylic Varnish Satin, Gloss	I	174-191	27	400-500	Cabinets, doors, paneling, furniture, floors	Durable, moisture, chemicals, abrasion and marring resistant	1 hr touch 3-4 recoat
Van Technologies, Inc. VanAqua-485 Water Based Topcoat	I	190	N/A	N/A	Kitchen cabinets, floors	Scratch and abrasion resistance, excellent adhesion, fast drying	15-30 min touch 30 min-1hr sand
Farwest, X-6697 Semi-Gloss Aquathane Waterborne Floor Finish	I	186	28	250-350	Hardwood floors, kitchen cabinets, coffee tables, wood furniture, table tops, clear wood trim	Non-yellowing, highly durable, stain resistant	30-45 min touch 3 hrs recoat
FUHR, Multi-Purpose Ultra Clear Urethane 275	I	160	29	N/A	Tile, concrete, hardwood floorings	Superior durability, wipeable, buffable	10 min touch 30 min sand
Manufacturing & Consulting Chemists, Inc., WCX Clear Topcoat WCX 1020-1080	I	160	29	300	Wood Cabinets, trim, furniture	Abrasion resistant, tough, excellent block resistant, mar resistant, fast drying	30 min touch 1 hr recoat
Behr, Premium Plus With Style Venetian Plaster Topcoat 775	I	142	N/A	N/A	High moisture and high traffic areas	Durable, water resistant	24 hrs
Fuhr, Multipurpose Ultra Clear Urethane Finish 255	I	57	31	N/A	High end furniture, doors, cabinets, windows	Fast dry, durable	10 min touch 30 min sand
Target Coatings, Oxford Hybrid Varnish 7000	I/E	182	N/A	N/A	Marine and architectural applications	UV resistant, durable	45 min touch 1.5 hrs recoat
JFB Hart Coatings, Inc HP-146, 1	I/E	100	33	240-480	Steel, aluminum, galvanized metal, concrete/block, masonry, wood	Superior color, gloss retention, non-yellowing, good chemical and abrasion resistance	8 min touch, 30 min recoat
Target Coatings, Emtech 8000 Conversion Varnish	I/E	80	32	500 @ 2 mil	Interior/exterior trim, furniture, fixtures	UV, water resistant, non-yellowing, scratch resistant	N/A
Fuhr, Waterborne Acrylic Varnish 355	I	73	30	N/A	Kitchen cabinets, furniture, molding, passage doors, millwork, wine racks	Excellent Durability, anti-sagging formula, water, chemical resistant	5 min touch 20 min sand
Fuhr, Aluminum Oxide Modified Urethane 855	I/E	57	32	N/A	Wood floors	Long lasting, durable, wear resistant	N/A
Fuhr, Waterborne Urethane Finish 255	I/E	57	31	N/A	High end furniture, doors, cabinets, windows	Fast dry, durable	10 min touch 30 min sand
Cal Western Paints Clear Acrylic Glaze	I/E	54	27	200-400	Wood, masonry, brick, paneling	Clear, low sheen	1 hr touch 3-4 hrs recoat
Fuhr, Ultra Clear Acrylic Urethane 285	I	53	31	N/A	Hardwood floors, wood furniture, passage doors, windows, cabinetry	Superior durability, wipe able, buff able	10 min touch 30 min sand
EPMAR, Kemiko Clear Acrylic Urethane 1	E	50	30	300-400	Wood trim, furniture, cement floors, facades, storage tank exteriors, bridges	Stain resistant, resilient	30 min touch 1 hr recoat
FUHR, Water Clear Acrylic Varnish 375	I	50	28	N/A	Kitchen cabinets, furniture, molding, passage doors, millwork, wine racks	Excellent mar, water, chemical resistance, great blocking resistance	10 min touch 20 min sand
Fuhr, Universal Acrylic Topcoat 9100 Series	I	18	44	N/A	Shutters, trim, doors, molding, cabinetry	Excellent mar resistance, anti-sagging, fast drying, high hardness	30 minutes

Fuhr, ZVOC High Solids Clear Coat 5000	I/E	0	38	N/A	Furniture molding, passage doors, millwork, wine racks	Chemical, water, anti sag resistance	5 min touch 20 min sand
Fuhr, ZVOC Low Solids Clear Coat #5200	I/E	0	20	N/A	Furniture molding, passage doors, millwork, wine racks	Excellent penetration, chemicals, water resistant	5 min touch 20 min sand
Fuhr, ZVOC Medium Solids Clear Coat 5100	I/E	0	29	N/A	Furniture molding, passage doors, millwork, wine racks	Excellent penetration, chemicals, water resistant	5 min touch 20 min sand
JFB Hart Coatings, Inc HP-105 Clear, 2	I/E	0	53	350-450	Steel, aluminum, galvanized metal, concrete/block, masonry, wood	Non-yellowing, UV, stain and chemicals resistant, highly scrubable, excellent durability, 2 hr pot life	4 hrs touch 6-8 hrs recoat
Rockler, Sam Maloof Oil/Wax Finish 58699/58677	I	0	N/A	N/A	All woodworking surfaces	High durability	24 hours
Silvertown Products, RhinoGuard Wood Defense	E	0	N/A	550	Wood decks, house siding, fences	Weather resistant, superior waterproofing, UV and scuff resistant	72 hours
Tried & True Wood Finishes Danish Oil, Original Wood Finish, Varnish Oil	I	0	N/A	N/A	Kitchen counters, table tops	High durability	N/A

N/A= Not Available

CWF Sanding Sealers
275 g/l and less

Samples 14

Coating Company, Product Name, Components	Interior Exterior	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal)	Recommended substrate/ exposure	Coating Characteristics	Drying Time
Glitsa American, Inc., Snap Dry Quick Dry Waterbase Sealer 1	I	261	31	400-500	Bare wood	Non-yellowing, fast dry	1.5 - 2.5 hours
Zinsser (Parks Corp.), Safe and Simple Sanding Sealer	I	248					
Vista Paint, 107 Acrithane Sanding Sealer	I	242	28	400-700	Woodwork, cabinets, furniture, paneling	Excellent durability, water & chemical resistant	1 hr touch 2 hr recoat
Vista Paint, TC10 W/B Sanding Sealer	I	240	30	850-950	Woodwork, cabinets, furniture, paneling	Excellent durability, water & chemical resistant	1 hr touch 2 hrs recoat
Rainguard, American 700 Clear Masonry Deck Sealer	N/A	236	N/A	100	Decks, resurfaced concrete, cementitious surfaces, other non-resilient substrates	Slip resistant, flexible, weather resistant	2 hours
Manufacturing & Consulting Chemists, Inc., WC Sanding Sealer WC-2044	I	235	28	300-400	Interior wood cabinets, trims	Powders well, fast drying	0.5 hr touch 1 hr recoat
Manufacturing & Consulting Chemists, Inc., WCX Sanding Sealer WC-2022	I	233	29	300-400	Interior wood cabinets, trims	Powders well, fast drying	0.5 hr touch 1 hr recoat
Insl-x, Envirocare Sanding Sealer	I	220	35	282	Wood floors, trim, cabinets, stairs, banisters	Waterbase, Non-Yellowing	0.5 hrs touch 3 hours recoat
Diamond Vogel Paints, Old Masters H2O Acrylic Sanding Sealer	I	181	30	240-481	Interior Wood Surfaces	Non-yellowing, fast dry	10 min touch 30 min. recoat
FUHR, Water Clear Sanding Sealer 365	E	50	28	N/A	Various wood surfaces	Great blocking , fast drying	15 minutes
FUHR, Universal Sanding Sealer 655	E	30	30	N/A	Various wood surfaces	Deep penetrating, fast drying	15 minutes
All Pro, Acrylic Urethane Waterborne Satin Sanding Sealer	I	1	29	300-450	Doors, trim, cabinets, furniture	Fast dry, non-flammable, excellent penetration	0.5 hr touch, 2-4 hrs recoat
FUHR, ZVOC High Viscosity Sanding Sealer 5350	E	0	20	N/A	Various wood surfaces	Excellent penetration, fast drying	15 minutes
FUHR, ZVOC Sanding Sealer 5300	E	0	19	N/A	Various wood surfaces	Excellent penetration , fast drying	15 minutes

N/A= Not Available

Clear Brushing Lacquers
680 g/L and less

Samples 12

Coating Company, Product Name, Components	Interior Exterior	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal) @3mils	Recommended substrate/ exposure	Coating Characteristics	Drying time to recoat
Color Wheel, Optima All Prime 330 1	I/E	115	35	300-400 @ 1.6mils	Concrete, masonry, stucco, wood, hardboard siding and cementitious siding, synthetic masonry stucco, aluminum, galvanized metals, copper, stainless steel, gypsum wallboard, veneer plaster, acoustical ceilings, fiberglass	Excellent adhesion, excellent alkali, efflorescence resistance, resistant to blistering, cracking, chipping, peeling, mildew resistant, outstanding stain blocking, excellent chalk resistance, resistant to moisture	4 hours
Color Wheel, Aquatec Industrial Acrylic Primer 1635, 1	I/E	87	44	300-500	Structural steel, aluminum, galvanized metals, ferrous metals, copper, stainless steel, fiberglass, polystyrene, misc. metals	Corrosion resistant, early moisture resistant, flash rust resistant	2 hours
Color Wheel, Aquatec 1644 1	I/E	250	N/A	N/A	N/A	High Abrasion, Chemical Resistant	N/A
Environmental Engineering & Coatings, Superior Environmental Products	I	0	N/A	N/A	Floors	Heat Resistant, chemical resistant	N/A
EPMAR, Kemiko Col-R-Tone III Acrylic Urethane 1	E	50	60	300-400	Cement floors, facades, steel/concrete storage tank exteriors, steel/concrete bridges, pumps	UV Resistant, non-yellowing	1 hour
EPMAR, Kemiko 44C Clear Acrylic Urethane, 1	E	50	30	300-400	Wood trim, furniture, cement floors, facades, storage tank exteriors, bridges	UV Resistant, non-yellowing	1 hour
Trinity Coatings, Nitro LC-530 Water White Clear Lacquer Series	I	550	18	118	High quality furniture, cabinets	Non-yellowing	30-45 min.
Trinity Coatings, Nitro LS-520 Water White Lacquer Sanding Sealer	I	550	14	66	Apply to bare wood on furniture, pianos, cabinets	Non-yellowing	25-45 min.
Vista Paint, TC60 W/B Semi Gloss Wood Lacquer	I	224	30	400	Cabinets, furniture, paneling	Excellent clarity	20-25 min.
Vista Paint, TC80 W/B Gloss Wood Lacquer	I	224	30	400	Cabinets, furniture, paneling	Excellent clarity	20-25 min.
Vista Paint, TC20 W/B Satin Wood Lacquer	I	214	31	400	Cabinets, furniture, paneling	Excellent clarity	20-25 min.
ZRC, Metallic Zinc Coating	E	0	44	N/A	Carbon steel, cast iron, galvanized/alum surfaces	Anti-corrosive	N/A

N/A= Not Available

Flats
100 - 50 g/L Samples 25

Coating Company, Product Name, Components	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal) @3mils	Recommended substrate/ exposure	Coating Characteristics	Drying time to recoat	Pot Life @70 deg./ Shelf Life
Color Wheel, Exterior Flat Wall Paint 3700	55	34	300-500	Concrete, masonry, stucco, wood plywood, hardboard, metal, steel aluminum	Mildew resistant, alkali resistant, resistant to blistering, cracking, chipping, peeling, excellent adhesion	4 hours	N/A
Diamond Vogel Paints, BF Series All Season Ext Flat Latex	92	34	182-273	Wood, masonry, galvanized surfaces	Superior durability	2-4 hours	N/A
Diamond Vogel Paints, BF Series Weather-Plate Ext 100% Acrylic Ltx	99	34	276-363	Siding, soffits, gutters, foundations	Excellent fade resistance	2-4 hours	N/A
Diamond Vogel Paints, DF Series Pro-Build Super Flat Int Latex	59	30	479	Plaster, drywall, wood, masonry	Flexible	4 hours	N/A
Diamond Vogel Paints, MC Series Permafex Elastomeric Coating	70	45	722	Stucco, concrete, masonry, primed wood	Prevents penetration of wind driven rain	4 hours	N/A
Diamond Vogel Paints, DF Series Hi-Build Super Flat Int Latex	59	30	479	Interior walls, plaster, drywall, wood, masonry	N/A	4 hours	N/A
Diamond Vogel Paints, DF-1524 Int Latex Texture Finish	72	25	401	Interior walls, plaster, drywall, wood, masonry	N/A	12 hours	N/A
Dunn Edwards, Flex Tex Texture Coating Coarse W 323	55	49	40-50	Masonry, wood, metal	N/A	4 hours	N/A
Dunn Edwards, Interior Velvet Flat Wall Paint W 401	65	44	300-450	Interior walls, ceilings	Exceptional hide, long lasting protection	4 hours	N/A
Dunn Edwards, Interior Latex Flat Enamel W 3447	60	42	350-400	Masonry, wood, metal	Exceptional hide, smooth flow out	4 hours	N/A
Dunn Edwards, Quik-Wall Latex Flat Wall Finish W 2140	65	44	250-350	Primed wood, concrete, metal	Excellent hide	2-3 hours	N/A
Dunn Edwards, Nevada Exterior Flat W 5807	55	40	75-200	Masonry	Durable, applies easily, good hide, excellent touch-up	4 hours	N/A
Dunn Edwards, Interior Maintenance Latex Flat Paint W 6266	60	33	250-350	Wood, concrete, metal	Superior hiding power, applies easily, touches up very well	2-3 hours	N/A
Dunn Edwards, Interior Maintenance Latex Flat Paint W 6196	65	42	250-350	Wood, concrete, metal	Superior hiding power, applies easily, touches up very well	4 hours	N/A
Dunn Edwards, Arizona Exterior Latex Flat Finish W 6140	65	35	200-375	Construction, maintenance painting, interior drywall	Good hide, very good touch-up	1 hour	N/A
Farwest, #900 Series Wonderglo Interior Flat Acrylic Latex	55	54	300-400	Drywall, plaster, brick, cement, masonry	Tough, durable, scrubable	2 hours	N/A
Farwest, #901 Wonderglo High Hide Interior Flat Acrylic Latex	51	37	300-400	Drywall, plaster, brick, cement, masonry	Tough, durable, scrubable	2 hours	N/A
Farwest, #950 Proline Vinyl Acrylic Flat Latex Int.	59	31	300-500	Walls, ceilings	Excellent wet, dry hiding qualities	2-4 hours	N/A
Farwest, A-A-2246 Proline Flat Latex Interior	55	31	300-500	Walls, ceilings	Excellent wet, dry hiding qualities	2-4 hours	N/A
ICI Paints (Glidden), GL1251 Speed-Wall Flat Interior Wall Paint	57	N/A	400	Walls, ceilings	Good dry hide, excellent touch-up ability, easy application, quick dry	2 hours	1 year
Kelly Moore, Acrylic Flat Wall Paint	98	36	300	Interior wallboard, plaster, masonry, ceilings, walls	Non-thinning	4 hours	N/A
Rodda, Flat Vinyl Acrylic Wall Paint	93	39	315	Exterior concrete, stucco, plaster, cement, cinder block, wallboard, asbestos shingles, brick, wood	N/A	3 hours	N/A
Sherwin Williams, Ultra Crete Textured Masonry Topcoat A44W800	55	51	70-80	Concrete, block, sheetrock, cement, primed steel, primed wood	Inhibits mildew	2 hours	N/A

Sherwin Williams, Interior Latex Flat Ceiling Paint A21W89	52	29	350-400	Ceilings of primed plaster, wallboard, wood, masonry, well bonded wallpaper, primed metal	N/A	4 hours	N/A
Vista Paint, 3000 Acribond	97	40	300-400	All exterior surfaces	Excellent color retention, mildew resistant	4-6 hours	N/A

N/A= Not Available

Flats
50 g/L & Less **Samples** **30**

Coating Company, Product Name, Components	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal) @3mils	Recommended substrate/ exposure	Coating Characteristics	Drying time to recoat
ChemRex, Inc (Sonneborn), Tuf-trac Tennis Green	0	47	70-125	Asphalt, concrete, tennis courts	Durable, resists variable weather conditions, nonglaring, slip-resistant safety finish	4 hours
Color Wheel, Exterior Acrylic Latex Flat 240	29	29	250-400	Variety of masonry, metal surfaces	High hiding, outstanding touch up properties, very good adhesion, resistant to moisture vapor	4 hours
Color Wheel, Hi-Hide Int Low VOC Latex Wall Paint 5500	1	35	300-500	Concrete, masonry, wood surfaces, gypsum wallboard. Metal, aluminum	Scrubtable, washable, non-yellowing	4 hours
Devoe High Performance Coatings Direct-to-Metal Primer & Flat Finish DEVFLEX 4020PF 4020-1000-white	76	44	275-350	Exterior of tanks, metal buildings, structural steel, piping, handrails, masonry construction	Direct-to-metal or masonry primer, shop applications, low VOC, low odor, resists flash rust, corrosion resistance	2 hours
Devoe High Performance Coatings Direct-to-Metal Primer & Flat Finish DEVFLEX 4020PF 4020-7100-red	80	44	275-350	Exterior of tanks, metal buildings, structural steel, piping, handrails, masonry construction	Direct-to-metal or masonry primer, shop applications, low VOC, low odor, resists flash rust, corrosion resistance	2 hours
Diamond Vogel Paints, DF-1591 Health Kote	0	38	300-400	Walls, ceilings, trim	Durable finish, excellent washability	12 hours
Diamond Vogel Paints, DE-1591 Health Kote Low Odor	0	36	285-380	Plaster, wallboard, wood, masonry	Durable finish, excellent washability	12 hours
Diamond Vogel Paints, DS-1591 Health Kote	0	34	271-362	Plaster, wallboard, wood, masonry	Durable finish, excellent washability	12 hours
Dunn Edwards, Nevada Exterior Flat Paint W 6267	40	33	300-450	Exterior surfaces	Touches up well, provides good hide	4 hours
Dunn Edwards, Sierra Low Odor Zero VOC Interior Flat Wall Finish W 501	0	36	350-400	Exceptional hide	Recommended for residential use	2-4 hours
Dunn Edwards Acoustikote Interior Acoustic Paint W 615	0	32	150-300	High hiding	Acoustic tile, ceilings	2 hours
Dunn Edwards, Cover Kote II Interior Flat Paint W 410	45	38	200-300	Durable, good hide	Durable finish, good hide	2-3 hours
Dunn Edwards, Exterior Paint Tan W 5995	38	34	200-400	Good hide	Stucco, concrete, slumpstone, split faced block, masonry surfaces	1 hour
Dunn Edwards, Exterior Paint Concrete Gray W 5996	40	34	200-400	Good hide	Stucco, concrete, slumpstone, split faced block, masonry surfaces	1 hour
EVR-Gard Coatings, 1400 Flat EVRCARE	0	N/A	350-400	Excellent hiding power, interior surfaces	Wallboard, wood, metal, masonry	4-6 hours
Frazeo, 018 Envirokote Interior Low Odor	5	34	200-350	Resistance to abrasion, blocking, yellowing.	Concrete, masonry, drywall, hardboard, metal	3-4 hours
FUHR, Z VOC White Ext/Int Latex Paint 6000	0	28	N/A	Excellent metal mar resistance, anti-sagging	Siding, sheetrock, shutters, trim, doors, molding	1 hour
ICI Paints (Glidden), Professional Finishes Ultra Build Interior Latex Flat GL8020	36	16	400	Good hide	Interior plaster, wallboard, masonry surfaces	2 hours
ICI Paints (Glidden), Wall Paint Int/Ext Latex Flat 920	36	N/A	400	Uniform flat finish	Int/Ext Surfaces	4 hours

Innovative Formulations Co. Ecological Paint-Interior/exterior FLAT	0	N/A	400-450	interior drywall, plaster, concrete, most masonry surfaces, covers properly primed wood & metal	one coat, fast dry, excellent weather-ability, durability, scrub resistance, "hideriffic" technology	2 hours
Innovative Formulations Co. Ecological Paint-Interior Paint-Mold Not FLAT	0	N/A	300-350	interior drywall, plaster, concrete, most masonry surfaces, covers properly primed wood & metal	one coat, fast dry, excellent weather-ability, durability, scrub resistance, "hideriffic" technology	2 hours
Rodda, Horizon Flat	13	40	330	Durable	Wallboard, concrete, masonry, cement block, cinder block, stone, brick, wood	2 hours
Sherwin Williams, Pro Mar 700 Interior Latex Flat B30W7700 Series	40	25	350-400	N/A	Walls, ceilings, plaster, wallboard, wood, masonry, primed metal	4 hours
Sherwin Williams, Harmony Interior Latex Flat B 5 Series	0	44	350-400	Inhibits growth of microbes	Drywall, masonry, concrete, cement, block	4 hours
Sherwin Williams, Color Accents Interior Latex Flat Y10 Series	49	36	350-400	Inhibits growth of microbes	Drywall, masonry, concrete, cement, block	4 hours
Smiland (Morwear), Interior Flat Acrylic Wall & Ceiling Paint 160-01	3	45	300-400	Superior hide, non-reflective flat finish	Walls, trim, masonry, drywall, plaster, concrete, wood, primed metal	4 hours
Vista Paint, XA11 Aurora Bond	16	44	300-350	Good adhesion	Wood, plywood, primed metal, masonry	4 hours
Vista Paint, RC10 Latex Roll Coat	26	37	600	Good adhesion	Particleboard, pressboard, plywood	1 hour
Vista Paint, 6100 Earth Coat Flat	1	39	350-400	Tough, durable	Interior drywall, plaster, concrete, wood	6 hours
Vista Paint, 3600 Coverall Maintenance Flat	49	38	350-500	Outstanding hide	Interior drywall, plaster, concrete, wood	2 hours

N/A= Not Available

Floor Coatings

100-50 g/L **Samples 8**

Coating Company, Product Name, Components	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal) @3mils	Physical Properties	Coating Characteristics	Gloss Characteristics	Drying time to recoat
Cloverdale, 02290 Step-Safe Non-Slip Coating	89	51	200-250	N/A	Exceptional color retention, water resistant, abrasion resistant	N/A	8 hours
Color Wheel, Acrylic Floor, Deck Paint 380	56	37	350-450	N/A	Exceptional color retention, chalk resistant, abrasion resistant	N/A	4 hours
Color Wheel, Ultracrete Tex-Trac Concrete Coating 3900	91	49	200-300	N/A	Excellent adhesion, long term durability, color retention, scrubbable, washable	N/A	2 hours
Insl-x, Sure Step Anti Slip Coating	97	41	329	N/A	Excellent resistance to abrasion, exceptional color retention	N/A	24 hours
JFB Hart Coatings, Inc HP-100, 3	67	41	650	N/A	Non-yellowing chemical resistant	N/A	6-8 hours
JFB Hart Coatings, Inc HP-146, 1	100	30	240-480	N/A	Chemical and abrasion resistant, non- yellowing	80° @60°	29 minutes
KST (Thoro), Thorocoat F-74 Water based fine textured acrylic coating for pedestrian traffic	56	49	4	N/A	Skid resistant, UV resistant, superior color uniformity, weather resistant	N/A	24 hours
KST (Thoro), Thorosheen Water Based 100% Acrylic Paint	56	38	4	N/A	Tough, durable, smooth film, long term adhesion, resists wind-driven rain, gungus, mildew, excellent color retention	N/A	2-4 hours

N/A= Not Available

Floor Coatings
50 g/l or less

Samples 26

Coating Company, Product Name, Components	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal) @3mils	Physical Properties	Coating Characteristics	Gloss Characteristics	Drying time to recoat
Andek, Polajoint	0	100	125	N/A	Highly resistant to mechanical damage, good chemical resistance	N/A	N/A
Andek, PolaFloor Epoxy Topping, 2	0	100	30	Tensile Strength 1750 psi	Impact resistant	Satin	N/A
Andek, PolaFloor P.U.R. Brushable, 3	0	100	N/A	Tensile Strength 2685 psi	Impact resistant	Satin	N/A
Benjamin Moore, M40 100% Solids Epoxy floor coating, 1	0	100	200	Adhesion 480psi, Tensile Strength 850 psi, Taber .06g	Abrasion resistant, non-flammable	95% @ 60deg.	12 hours
Benjamin Moore, M41 Epoxy floor sealer, 1	0	51	325	Tensile Strength 8800 psi, Taber .05g	Impact resistant	50% @ 60deg.	5 hours
CeRam Kote, CeRam-Floor 3 Part Self-Leveling Ceramic Slurry, 3	0	100	40	Tensile Strength 1637 psi	Durable, water resistant	N/A	24 hour cure time
CeRam Kote, CeRam-Floor 3 Part Trowelable Resurfacing Material, 3	0	100	13	N/A	Durable, wear resistant	N/A	10-12 hour cure time
ChemRex Inc (Sonneborne), Tuf-trac Tennis Green	0	47	70-125	N/A	Durable, nonglaring, slip-resistant safety finish	Flat	4 hours
Color Wheel, 381 Latex Floor Paint, Flat, 1	29	39	200	Non-skid finish and blistering, cracking, chipping and peeling resistant	Excellent color retention and chalk resistance	85° 5-15	4 hours
Devoe High Performance Coatings 100% Solids Epoxy Resurfacer DEVFLOOR 525 Cat # 525	5	N/A	107-321	Concrete floors	Good chemical and abrasion resistance, low odor	N/A	10-24 hours
Devoe High Performance Coatings Waterborne Urethane DEVFLOOR 569 Cat # 569	17	N/A	320-400	Concrete floors	For concrete floors that are subjected to moderate chemical spills and abrasive traffic	N/A	6-24 hours
Dunn Edwards, Athletic Field Stripping Paint W 5361	0	37	14-15	N/A	Resistant to blistering	N/A	2 hours
Farwest, Deck Coatings 2001	37	47	100	N/A	Withstands rough weather	N/A	1 day
Gaco Western Inc., Gaco Flex U-62	0	100	1600	Tensile Strength 2250 psi	Good weatherability, durability is excellent	N/A	N/A
Insl-x, 100% Solids Epoxy Coating, 2	0	100	533	Self leveling epoxy for severe environments	Abrasions and chemical resistant	High Gloss	N/A
ITW Resin Technologies, IMPAX 650 SL Epoxy, 2	0	100	160	N/A	N/A	Full Gloss	N/A
ITW Resin Technologies, IMPAX 700 High Solids W/B Epoxy, 2	25	96	200	N/A	N/A	Full Gloss	N/A
JFB Hart Coatings, Inc HP-105 Pigmented Polyurethane, 2	12	63	250-650	Adhesion 5B, Tensile 2609 psi	High gloss UV and chemical resistant	Up to 95° @60°	N/A
JFB Hart Coatings, Inc HP-147 polyurethane, 1	0	N/A	N/A	Tensile Strength 4000 psi, pH=8.2-9.2	UV resistant	80° ± 5 @60°	N/A

JFB Hart Coatings, Inc HP-330 Clear or Pigmented polyurethane, 2	11	90	480	N/A	High gloss, acid and chemical resistant	Up to 85° @60°	N/A
KST (Snow Roof Systems), Safe-T-Kote	1	N/A	100	N/A	Skid resistant, won't crack or peel, UV resistant	N/A	N/A
Seal-Krete, Proformance Skid Proof	0	N/A	40	Tensile Strength 35.5 psi	Anti-skid, waterproof, weather-resistant, impact resistant, salts resistant, chlorine resistant	N/A	N/A
Seal-Krete, Skid Proof EZ Coat	40	67	150	N/A	UV resistant, water resistant, salt resistant	N/A	6 hours
Sherwin Williams Armorseal Armor-Plex I/E Waterbased Urethane, 2	41	58	309-464	Polyester/urethane cures to a highly flexible film	Chemical and abrasion resistant	High Gloss	1 day
Sherwin Williams, Armorseal 650 SI/RC Self-leveling Recoatable Epoxy, 2	3	100	50	Self-leveling, can be applied to provide a nonslip texture	Chemical, impact, solvent and abrasion resistant	High Gloss	8 hours
Sherwin Williams, Armorseal 650HB/RC	0	100	15-50	Self-leveling	Abrasion resistant, excellent adhesion, chemical resistant, impact resistant, seamless, ultra-build durable coating	High Gloss	3 days

N/A= Not Available

I M Coatings

250-100 g/l or less

Samples

25

Coating Company, Product Name, Components	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal) @3mils	Recommended substrate/exposure	Coating Characteristics	Gloss Characteristics	Pot Life @70 deg./ Shelf Life
Ameron, Amershield VOC	170	73	234	Steel, bridges, tanks, piping, rail cars, industrial plants, marine decks, boatops, concrete walls & floors	Good chemical & stain resistance, tough, flexible	Excellent gloss retention	N/A
Color Wheel, Aquatec Industrial Acrylic Enamel 1600	120	43	300-500	Steel, aluminum, metals, wood, plywood, wallboard, concrete, brick, plaster	Tough, durable, excellent chemical resistance	N/A	N/A
Color Wheel, Aquatec Industrial Acrylic Satin Enamel 1650	123	40	300-500	Steel, aluminum, metals, wood, plywood, wallboard, concrete, brick, plaster	Tough, durable, excellent chemical resistance	N/A	N/A
Du Pont, Corlar VHS 90P Epoxy mastic, 2	101	90	480	Bridges, Structural steel, corrosive environments	.17g loss/1000 cycle scrub	N/A	1 year
Du Pont, Tufcote 72P, W/B DTM Acrylic Enamel	228	36	190	Steel, Galvanized metal, Aluminum, concrete	Excellent color/gloss retention	70	2 years
ICI Paints (Devoe), Bar-Rust 235H	234	74	1187	Drywall, plaster, wood	Exceptional corrosion protection, excellent adhesion	N/A	N/A
ICI Paints (Devoe), Devthane 359H	250	72	1116	Steel, concrete, masonry, drywall, aluminum, brick	Excellent gloss & color retention, excellent abrasion & chemical resistance, excellent resistance to marring, chipping, scratching	N/A	N/A
ICI Paints (Devoe), Devthane 378H	225	73	1171	Steel, piping, metal buildings, concrete, brick	Exceptional gloss, color retention, excellent abrasion, resistant to marring, chipping, scratching	N/A	N/A
ICI Paints (Devoe), Devthane 379H	250	70	N/A	Concrete, steel floors, masonry, drywall, plaster, brick	Exceptional gloss, color retention, excellent abrasion, resistant to marring, chipping, scratching	N/A	N/A
ICI Paints (Devoe), Catha-Coat 302V	246	78	1250	Steel	Exceptional corrosion resistance	N/A	N/A

ICI Paints (Devoe), Devflex 4206Q1	190	42	674	Tanks, wood or metal trim, shutters, siding, furniture, metal fences	Excellent gloss & color retention, excellent abrasion & chemical resistance, excellent resistance to marring, chipping, scratching	N/A	N/A
Insl-x, Aqualock w/b primer, sealer, stain killer 0500	118	43	230	Industrial applications over painted surfaces, top or mid coat	Cross Hatch adhesion- 5	Eggshell, low sheen	N/A/1 year
Insl-x, Insl-Thane II enamel 7500, 1	174	41	219	Light industrial uses	Cross Hatch Adhesion-5	80	N/A/1 year
International Protective Coatings, Interfine 979 Polysiloxane, 2	165	76	405	Bridges, offshore structures, tank farms and general industrial and commercial steelwork	Excellent color, gloss retention and corrosion resistance	Gloss	2 hours/N/A
Prosooco, Defacer Eraser Graffiti Barrier	105	18	75-400	Concrete block, Fired clay, marble, travertine, limestone, granite, sandstone, slate	Multi-purpose	N/A	N/A
Sherwin Williams, Epo-Plex Multi-Mil W/B Epoxy, 2	240	42	224	Primed steel and masonry surfaces, concrete, plaster, wallboard and wood	141mg loss/1000 cycles 1 kg load	N/A	8 hours/1 year
Sherwin Williams, Zinc Clad VI, W/B Organic Zinc Rich Epoxy	163	45	241	Blasted steel on barges, ships, fabrication shops, chemical plants, drilling rigs	Cathodic protection, corrosion resistance	N/A	8 hours/1year
Smiland (Morwear), 100% Acrylic Graffiti Coat Clear 2554-70	250	N/A	300-400	Mildew resistant	N/A	N/A	N/A
Wasser, MC-Aluminum 200 Topcoat, 1	200	76	390	Weathered or corroded Steel, Galvanized Steel	Corrosion resistant	matte	N/A/ 1 year
Wasser, MC-Ferrox A 200 Topcoat, 1	200	74	379	Bridges, Rail Cars, Tanks, Ships, any steel	Weather resistant	Low gloss/ matte	N/A/1 year
Wasser, MC-Luster 200 mid or top coat, 1	200	74	379	Marine Splash zone, exterior steel	Abrasion, UV resistant	20° -60°	N/A/1 year
Wasser, MC-Miomastic 200 Topcoat, 1	200	76	390	Old weathered coatings; off shore and harsh environments	Offshore harsh environments	Matte	N/A/1 year
Wasser, MC-Miozinc 200 zinc-primer, 1	200	76	390	Tanks, Chemical/marine structures, bridges	Corrosion resistant	Flat	N/A/1 year
Wasser, MC-Prepbond 200 primer, 1	200	76	390	Steel	Rust proof	Matte	N/A/1 year
Wasser, MC-Shieldcoat 200 Topcoat, 1	200	74	379	Containment ponds and tanks	Color/ gloss retention	60°-90° as required	N/A/1 year

N/A= Not Available

IM Coatings
100 g/l or less

Samples 80

Coating Company, Product Name, Components	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal) @3mils	Recommended substrate/exposure	Coating Characteristics	Gloss Characteristics	Pot Life @70 deg./ Shelf Life
Air Products, Aquamarine 701 Curing Agent	0	57	140-170	Floors	Excellent adhesion, Fast drying, good water resistance	N/A	2 years
Carboline, Carbozinc 11 WB	0	79	271	Steel	Excellent corrosion protection, good resistance to salting	N/A	1 hour

Color Wheel, Aquatec Industrial Acrylic Primer 1635	87	44	300-500	Steel, aluminum, galvanized metals, ferrous metals, copper, stainless steel, fiberglass, polystyrene	Chemical resistant, corrosion resistant, fast drying, moisture resistant	Primer	N/A
Devoe High Performance Coatings 100% Solids Epoxy Resurfacer DEVFLOOR 525 Cat # 525	5	N/A	107-321	Concrete floors	Good chemical and abrasion resistance, low odor	10-24 hours	N/A
Devoe High Performance Coatings Waterborne Urethane DEVFLOOR 569 Cat # 569	17	N/A	320-400	Concrete floors	For concrete floors that are subjected to moderate chemical spills and abrasive traffic	6-24 hours	N/A
Duromar, HPL-1110	0	100	N/A	Concrete, floors	Abrasion, corrosion resistant	N/A	N/A
Duromar, HPL 1111	0	100	N/A	Concrete, floors	Abrasion, corrosion resistant	N/A	N/A
Duromar, HPL-1301	0	100	N/A	Concrete, floors	Abrasion, corrosion resistant	N/A	N/A
Duromar, HPL-1510	0	100	N/A	Concrete, floors	Abrasion, corrosion resistant	N/A	N/A
Duromar, HPL-2110	0	100	N/A	Concrete, floors	Abrasion, corrosion resistant	N/A	N/A
Duromar, HPL-2131	0	100	N/A	Concrete, floors	Abrasion, corrosion resistant	N/A	N/A
Duromar, HPL-2201	0	100	N/A	Concrete, floors	Abrasion, corrosion resistant	N/A	N/A
Duromar, HPL-2221	0	100	N/A	Concrete, floors	Abrasion, corrosion resistant	N/A	N/A
Duromar, HPL-2310	0	100	N/A	Concrete, floors	Abrasion, corrosion resistant	N/A	N/A
Duromar, HPL-2510	0	100	N/A	Concrete, floors	Abrasion, corrosion resistant	N/A	N/A
Duromar, HPL-2510 UW	0	100	N/A	Concrete, floors	Abrasion, corrosion resistant	N/A	N/A
Duromar, HPL-3320	0	100	N/A	Concrete, floors	Abrasion, corrosion resistant	N/A	N/A
Duromar, HPL-4300	0	100	N/A	Concrete, floors	Abrasion, corrosion resistant	N/A	N/A
Duromar, HPL-4310	0	100	N/A	Concrete, floors	Abrasion, corrosion resistant	N/A	N/A
Duromar, HPL-4320	0	100	N/A	Concrete, floors	Abrasion, corrosion resistant	N/A	N/A
Duromar, HPL-4321	0	100	N/A	Concrete, floors	Abrasion, corrosion resistant	N/A	N/A
Duromar, HPL-4323	0	100	N/A	Concrete, floors	Abrasion, corrosion resistant	N/A	N/A
Duromar, HPL-5220	0	100	N/A	Concrete, floors	Abrasion, corrosion resistant	N/A	N/A
Enviroline, 376F-30 epoxy petroleum industry, 2	0	100	534	Petrol. Bulk storage tank linings, floors, tanks pools, troughs, sumps	Abrasion resistance, good flexibility	N/A	30min/2 years
Enviroline, 393-PM epoxy, 2	0	100	534	Storage tanks, floors	Corrosion/stain resistant, low temp. application	Excellent gloss	15min/2 years
Enviroline, 394FS epoxy, 1	0	100	534	Pipe coating repair	Corrosion, abrasion resistant	N/A	16min/2 years
Enviroline, 399-30 petroleum Ind., 2	0	100	534	Steel & concrete storage tanks, pipes, sumps	Cathodic disbondment resistant	N/A	30min/2 years
Enviroline, 399ABR epoxy, 1	0	100	534	Potash mines, ext. pipelines, slurry tanks	Corrosion resistant, abrasion resistant	N/A	15min @100F/ N/A
Enviroline, 124 epoxy (3 cure rates available), 2	0	100	534	Pits and pinholes in steel, concrete	Chemical resistance, Hardness 75-80	N/A	8-12min/ 2 years

Enviroline, 150 epoxy, 2	0	100	534	Chem. containment vessels, storage tanks steel, concrete, floors	Abrasion/ impact resistant	N/A	5min @100deg/2years
Enviroline, 222 epoxy, 2	0	100	534	Sewer pipes, lift stations, wet wells, containment basins	Moisture tolerant	N/A	10min@ 100deg/2 years
Enviroline, 224 epoxy, 2	0	100	534	Waster water treatment application	Chemical/ moisture resistant	N/A	21min/2 years
Enviroline, 225 epoxy, 2	0	100	534	tanks, Waste water treatment plants, steel & concrete, floors	Acid resistant	N/A	10min@ 100deg/2 years
Enviroline, 232 epoxy lining, 2	0	100	534	Wastewater treatment basins, Steel, concrete, storage tanks.	Abrasion, impact resistant, Chemical resistant	N/A	7min@ 100deg/2 years
Enviroline, 240CW epoxy, 2	0	100	534	Concrete/ steel, car washes concrete trenches	Thermal and mechanical shock resistant	N/A	13min @ 100deg/ 2years
Enviroline, 250 epoxy, 2	0	100	534	Steel & concrete, storage tanks, wastewater treatment/ cooling tower basins	Abrasion/ impact resistant	N/A	13min @100F/2 years
Enviroline, 333 epoxy aquatic environments, 2	0	100	534	Swimming pools, fountains, aquatic theme parks, concrete	Moisture tolerant	N/A	26min/2 years
Enviroline, 333BR epoxy aquatic environments, 2	0	100	534	Swimming pools, water theme parks, fountains, concrete	Chemical/ moisture tolerant	N/A	26min/2 years
Enviroline, 370 epoxy FDA approved int./ext., 2	0	100	534	Rail hopper cars, metal	Reverse impact resistant, flexible	High gloss	30min/2 years
Enviroline, 376F-60 epoxy glass flake lining for pet. Applications., 2	0	100	534	Steel, concrete, bulk storage tanks, pipes, pits	Abrasion/heat/ chemical resistant,	N/A	30min/2 years
Enviroline, 399-60 epoxy petroleum Ind., 2	0	100	534	Reinforced coating for steel & concrete	Chemical and solvent resistant	N/A	30min/2 years
Enviroline, 50 epoxy primer, 2	0	100	534	Concrete or masonry	Moisture tolerant	N/A	15-20min /2 years
EPMAR, Sta-Crete SS1211	0	100	N/A	Cement, cinder block walls	Water/chemical resistant	N/A	30 minutes
Euclid Chemical Company, Euco epoxy Tufcoat HB	0	100	100-125	Warehouse floors, auto repair, chemical plants, showrooms	Wear resistant	Semi-gloss	30-40 minutes
Everest Coatings, Evercoat 900 Spray Polyurea Coating	0	100	100	Various substrates	Flexible, durable, excellent adhesion	N/A	N/A
Everest Coatings, Evercoat 905 Aluminized Spray Polyurea Coating	0	100	100	Various substrates	Flexible, durable, excellent adhesion	N/A	N/A
Everest Coatings, EnviroSil 570 silicone elastomeric coating, 2	0	65	100	Protection for roof systems	Weather resistant	N/A	6 months
Gaco Western Inc., Gaco Flex RU-92,	0	N/A	1600	Lining steel, masonry or wood tanks, silos, pipes, flumes	Outstanding durability	N/A	1 year
Gaco Western Inc., GacoFlex LM-60 Urethane, 2	0	100	25	Concrete, metal, plywood	Salt/alkali resistant	N/A	1 hour
Gaco Western Inc., GacoSil S-50 Water-Based Clear Silicone, 1	0	19	287	Decks, metal roofs, where VOC would be dangerous	Weather proof	N/A	1 year

Gaco Western Inc., U-62 urethane base and topcoat, 2	0	100	533	Floors of plywood, concrete, metal	Solvent resistant	N/A	1 year
Gemini, Nannapeel Waterborne Strippable Booth Coating	2	49	786	Booth coating	Fast drying	N/A	N/A
Global EcoTechnologies, Inc. Endura-Flex 1200P Epoxy Primer Sealer	0	100	1604	Steel and porous substrates	For exposure to chemical and physical environments found in water and water treatment industries	When wet or tacky to touch	40-50 minutes
ICI Paints (Devoe), High Performance Coatings Waterborne Aliphatic Acrylic Urethane Finish 399	60	49	786	Steel floors, masonry, drywall, plaster, concrete, block, aluminum	Excellent gloss & color retention, excellent resistance to marring & chipping	N/A	N/A
Pacific Polymers, Res-Crete Epoxy Protective Coating or Lining, 2	0	100	50	Aggregate mix for floors/decks, overlays	Strong	N/A	35 minutes
Polibrid Coatings, Polibrid 705	0	100	1604	Concrete, steel	Tough, flexible	N/A	2 years
Polibrid Coatings, Polibrid 706	0	100	1604	Geotextile Fabrics	Tough, flexible, resilient elastomeric polyurethane	N/A	1 year
Polibrid Coatings, Polibrid 670-S	3	99	1599	Concrete	Good adhesion, superior moisture tolerance	N/A	1 year
Sherwin Williams, Envirolastic AR520 PW, 2	0	100	6 to 53	Pipe, tanks	Fast cure	N/A	1 year
Sherwin Williams, Envirolastic AR520 SS, 2	0	100	6 to 53	Floors, decks	Fast cure	N/A	1 year
Sherwin Williams, Envirolastic AR425, 2	0	100	6 to 53	Tanks, marine bridges, decks, aquariums, mechanical rooms, manhole linings, basins, reservoirs	Tough, flexible, impact resistant, waterproof	N/A	1 year
Sherwin Williams, Magnaplate Reinforced Vinyl Laminate System, 2	40	100	100	Steel storage tanks, lining system for secondary containment applications	Chemical resistant	N/A	3 months
Sherwin Williams, Cor-Cote E.N. 7000 High Build Epoxy Novolac Coating, 2	0	100	115-160	Protection of steel, concrete floors, walls	Excellent adhesion, high build, chemical resistant, abrasion resistant, corrosion resistant	N/A	18 months
Sherwin Williams, Cor-Cote HP High Performance Epoxy, 2	0	100	160-320	Protection of steel surfaces	Stain resistant, chemical resistant	N/A	18 months
Sherwin Williams, Corobond Conductive Epoxy Primer, 2	0	100	250-400	Concrete substrate	Excellent bond to concrete substrate	Gloss	60 minutes/ 18 months
Sherwin Williams, Dura-Plate UHS Ultra High Solids Epoxy TRM.35, 2	40	98	130-160	Steel & concrete surfaces	Superior protection	Gloss	45 minutes/ 36 months
Sherwin Williams, Dura-Plate UHS Primer Ultra High Solids Epoxy TRM.33, 2	40	98	200-400	Prepared steel, concrete surfaces	Excellent surface wetting & adhesion	Gloss	45 minutes/ 36 months
Sherwin Williams, Envirolastic AR200 HD, 2	30	100	6 to 80	Tank lining	Tough, hard, abrasion resistant	N/A	1 year
Sherwin Williams, Envirolastic AR530 Brush Grade, 2	0	100	6 to 53	Tank lining	Fast cure, seamless, flexible	N/A	1 year

Sherwin Williams, Nova-Plate UHS Primer Ultra High Solids Epoxy TRM.37, 2	12	98	133-262	Tank interiors, well deck overheads	Excellent surface wetting & adhesion	N/A	1 year
Sherwin Williams, Nova-Plate UHS Ultra High Solids Epoxy TRM.38, 2	12	98	130-160	Ballast tank interiors, well deck overheads, oil tank interiors	Superior protection	N/A	1 year
Sherwin Williams, Poly-Glass Polyester Laminate System, 2	40	100	100	Interior storage tanks	Chemically resistant	N/A	3 months
Sherwin Williams, Sher-Tuff Epoxy Flexible Epoxy Coating, 2	0	100	60-80	Kitchens, rooms, storage areas, packaging areas, locker rooms, showers, loading docks	Tough, chemical resistant	N/A	1 year
Sherwin Williams, Sher-Tuff Urethane Enamel Coating, 2	0	100	320-533	Structure steel, tank exteriors, steel, metal decking	High chemical resistance	N/A	1 year
Sherwin Williams, Zinc Clad XI, 2	0	68	220-365	Properly blasted steel	Abrasion and corrosion resistant	Flat	1 year (part E), 24 months (part F)
Sherwin Williams, Tower-Guard HS Transmission Tower Coating	70	89	145-240	Electrical towers, substation towers, poles, fences, duct work	Corrosion resistant, excellent exterior durability	N/A	1 year
Wasser, MC-Miozinc 100, 1	100	73	1171 @ 1 mil	Blast cleaned or power tool cleaned surfaces	Outstanding corrosion resistance	Matte	1 year
Wasser, MC-Luster 100, 1	100	70	1098 @ 1 mil	Applied anywhere including marine splash zones	UV and abrasion resistant	Semi-gloss	1 year
Wasser, MC-CR 100, 1	100	73	1171 @ 1 mil	Overcoat for old lead based paints	Resists peeling, superior adhesion	N/A	N/A
ZRC, Galvanizing Compound Metallic Zinc Coating, 2	0	44	232	Apply to carbon steel, cast iron, hot-dip galvanized, aluminum	Pencil Hardness 4B, anti-corrosion protection	Flat	1 year

N/A= Not Available

**High Temperature IMC
420g/L and less**

Samples 24

Coating Company and Product Name, components	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal) @3mils	Recommended substrate/ exposure	Coating Characteristics	Temperature Resistance	Pot Life @70 deg./ Shelf Life
Dampney, Thurmalox 200C, 1	410	42	219	Stacks, reformers, furnaces, compressors, piping, process vessels, heater, boiler casings, engines, pumps	Outstanding adhesion, film integrity, color stability, corrosion, weathering, thermal shock resistance	500	1 year
Dampney, Thurmalox 210C, 2	381	30	160	Stacks, refinery equipment, reformers, furnaces, turbines, engines, Pumps, manifolds, heat exchangers	Outstanding adhesion, film integrity, color stability, corrosion, weathering, thermal shock resistance	500	1 year
Dampney, Thurmalox 216 Topcoat, 2	316	62	332	Insulated hot equipment and piping and equipment exposed to severer thermal shock to 450°	Durable, tough, excellent chemical resistance	450	1 year
Dampney, Thurmalox 218 Primer, 2	312	61	329	Metal surfaces, equipment exposed to wet-dry-wet cyclic conditions from ambient to 450°	Durable, tough, excellent chemical resistance	450	1 year

Dampney, Thurmalox 219 Topcoat , 2	312	56	329	Metal surfaces, equipment exposed to wet-dry-wet cyclic conditions from ambient to 450°	Durable, tough, excellent chemical resistance	450	1 year
Dampney, Thurmalox 245C, 2	396	50	278	Stacks, breechings, boiler casings, exhausts, heat exchangers, heaters, crackers, furnaces	Excellent adhesion	1000	6 months
Dampney, Thurmalox 225HB, 1	333	60	320	Stacks, Manifolds, mufflers, hot piping, process vessels, refinery equipment, furnaces, ovens	Excellent adhesion	1000	1 year
Dampney, Thurmalox 2600, 1	371	56	300	Interior walls of boilers, furnaces, breechings, ducts, and stacks. Dry scrubbers	Tough, chemical & abrasion resistant	600	1 year
Dampney, Thurmalox 2804, 1	155	28	150	Stacks, breechings, boiler casings, refinery equipment, reformers, kilns, ovens, engines, manifolds	Outstanding adhesion, film integrity, color stability, corrosion, weathering, thermal shock resistance	1000	1 year
Dampney, Thurmalox 280C, 1	419	38	203	Stacks, breechings, heaters, cracker, reformers, kilns, ovens, compressors, engines, piping, pumps	Outstanding adhesion, film integrity, color stability, corrosion, weathering, thermal shock resistance	1200	1 year
Dampney, Thurmalox 260C, 1	381	60	350	Provides an early warning indicator of process vessel overheating due to gas bypassing or refractory failure	Outstanding adhesion, film integrity, color stability, corrosion, weathering, thermal shock resistance	500	1 year
Dampney, Thurmalox 230C, 1	372	56	300	Stacks, Manifolds, mufflers, hot piping, process vessels, refinery equipment, furnaces, ovens	Outstanding adhesion, film integrity, color stability, corrosion, weathering, thermal shock resistance	1000	1 year
Dampney, Thurmalox 70C, 1	413	52	278	Stainless steel piping , vessels, and equipment	Excellent adhesion	700	1 year
Ellis, 982 Hi-Heat Black & 983 Hi-Heat Aluminum	420	55	578-598	Boiler fronts, Heat exchanger	Good hide & coverage, long term protection	1200	1 year

N/A= Not Available

Zinc Rich IM Coatings

250 g/l & less

Samples

6

Coating Company, Product Name, Components	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal) @3mils	Recommended substrate/ exposure	Coating Characteristics	Drying time to recoat	Pot Life @70 deg./ Shelf Life
Ameron, W/B Inorganic Zinc Silicate Primer	0	N/A	1010	Bridges, cranes, offshore platforms	Resistance to mudcracking, rapid water resistance, fast drying & handling	3-22 hours	8
ICI Paints (Devoe), High Performance Coatings Catha Coat 302V Zinc Primer	246	78	1250	Steel structures, tanks, equipments, piping	Exceptional resistance to corrosion, mud cracking, fast dry	15 hours	2 years
ICI Paints (Devoe), Catha Coat 305 Water Based Inorganic Zinc Coating	0	61	978	Steel structures, tanks, equipments, piping	Resistance to solvents, good color contrast, resists mudcracking	2 hours	5 hours
Sherwin Williams, Zinc Clad XI, 2	0	68	220-365	Steel surfaces	Abrasion resistant, fast drying/curing, long term durability	4 hours	12 months (part E)/ 24 months (part F)
Zinc Plate Waterbased Inorganic Zinc Rich Preconstruction Primer	0	45	690-1000	Steel, marine vessels	Heat resistant, protects against corrosion, fast dry	3 hours	9 months
ZRC, Galvanite	0	N/A	N/A	N/A	N/A	N/A	N/A

N/A= Not Available

Nonflats (High Gloss)

150-50 g/l Samples 8

Coating Company, Product Name, Components	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal) @3mils	Recommended substrate/ exposure	Coating Characteristics	Drying time to recoat
Devoe High Performance Coatings Waterborne Aliphatic Acrylic DEVTHANE 399 Cat # 399KXXXX	60	49	786	Concrete or steel floors, primered steel, masonry, drywall, plaster, galvanized steel, aluminum, glazed brick	Low VOC, excellent resistance to marring and chipping, low odor	2 hours
Dulux Paint Centers Dulux Ultra-Interior/Exterior Gloss Enamel 1508-XXXX	120	43	345-460	Wood, metal, and masonry surfaces	Interior/Exterior use, resistance to yellowing, stain blocking and stain resistance, moisture resistance,	2 hours
Diamond Vogel Paints, V-Cote 131 Waterborne Acrylic Epoxy	135	35	609	Interior & Exterior walls, steel,	High gloss, Low odor	4 hours
Dupont, IMRON 230ZV	90	77	N/A	Walls	Sheen: >90 @ 60 degree, Chemical resistant, flexible, abrasion resistant	N/A
Frazer, 041 Latex Gloss Enamel Interior	146	35	150-400	Block, concrete, drywall, hardboard, metal, plaster, wood	Sheen: 80-85 @ 60, High hiding, tough, washable, good mar resistance	8 hours
Pittsburgh Paints, Brilliant Reflections 51-45 Series	120	38	400-500	Cabinets, garden equipment, kitchen walls, wood, exterior trim, lawn/porch furniture, interior trim	Sheen: 70-100 @ 60, High hiding, tough, washable, good mar resistance	4 hours
Pittsburgh Paints, Manor Hall Int/Ext Gloss Acrylic Latex 52-110 Series	149	38	400-450	Cabinets, garden equipment, kitchen walls, wood, exterior trim, lawn/porch furniture, interior trim	Sheen: 70-100 @ 60, High hiding, tough, washable, good mar resistance	4 hours
Sherwin Williams, SuperPaint Ext. High Gloss Latex Enamel A85 Series	119	42	350-400	Wood, metal, steel, masonry, stucco, vinyl trim, shutters	Sheen: 70+ @ 60, Block resistant, moisture resistant, gloss retention	18 hours

N/A= Not Available

Nonflats (High Gloss)

50 g/L and Less Samples 1

Coating Company, Product Name, Components	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal) @3mils	Recommended substrate/ exposure	Coating Characteristics	Drying time to recoat
Innovative Formulations Co. Interior Paint-Mold Not-High Gloss	0	N/A	400-450	interior drywall, plaster, concrete, most masonry surfaces, covers properly primed wood & metal, resistance to fungi	one coat, fast dry, strong adhesion, excellent weather-ability, durability, scrub resistance, "hideriffic" technology	2 hours

N/A= Not Available

Nonflats (Gloss)

150 g/l to 50 g/l Samples 3

Coating Company and Product Name	VOC content (gm/l)	Solids (% by volume)	Coverage	Recommended substrate/ exposure	Coating Characteristics	Drying time to recoat
Seal-Krete, Floor Tex/ Skid-Proof EZ Coat	64	N/A	150	Concrete, wood, primed metal, styrofoam	Gloss finish, waterproof, weather resistant, impact resistant	N/A

Target Coatings, Emtech U9300 Polycarbonate Urethane Top Coat (Gloss)	60	32	500	Wood substrates	Gloss finish, UV resistant	N/A
Vista Paint, Carefree 8500, Ext.	145	36	300-400	Drywall, concrete, wood, metal	Sheen: 78-82 @ 60, Outstanding weatherability, excellent scrubability, durability	8 hours

N/A= Not Available

**Nonflats (Gloss)
50 g/l and less****Samples 2**

Coating Company and Product Name	VOC content (gm/l)	Solids (% by volume)	Coverage	Recommended substrate/ exposure	Coating Characteristics	Drying time to recoat
Mills Superior Paints, Envirolac Legacy, Acrylic Water Borne 2600, Int./ext.	1	39	350-400	Various Substrates	Sheen: 70-75 @ 60, Tough, durable, block resistant	4 hours
Rust-Oleum (Sierra), Beyond Multi Purpose Enamel	0	38	214	Doors, cabinets, trim, furniture, equipment tanks	Sheen 75-80 @ 60, Excellent adhesion	N/A

N/A= Not Available

**Nonflats (Semi-Gloss)
150 - 50 g/l****Samples 14**

Coating Company and Product Name	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal) @3mils	Recommended substrate/ exposure	Coating Characteristics	Drying time to recoat
Color Wheel, Hi-Hide Semi-Gloss 220, 1	105	34	300-500	Concrete, Masonry, Plaster, Wood Surfaces	Sheen 50-70 @ 60, excellent adhesion, exceptional resistant to burnishing, non-yellowing, extremely scrubable, washable	8 hours
Color Wheel, Vina-Gloss Int Latex Enamel 420	107	33	300-500	Concrete, Masonry, Plaster, Wood Surfaces	Sheen 40-60 @ 60, excellent adhesion, exceptional resistant to burnishing, non-yellowing, extremely scrubable, washable	8 hours
Diamond Vogel Paints, BN Series Permacryl Ext. Semi Gloss	121	36	577	Metal, Aluminum, exterior wood, block, concrete	Semi-gloss finish, fade resistant, durable	2-4 hours
Diamond Vogel Paints, Pro Plus Int. Semi Gloss Latex	64	31	501	Plaster, wallboard, wood	Semi-gloss finish, excellent application characteristics	4 hours
Frazeo, 024 Speedsheen Semi Gloss Int. Vinyl	100	28	150-400	Int. Walls, Woodwork, Doors, trim	Sheen 65-75 @ 60, tough, flexible	3-4 hours
Frazeo, 128 Satin Glide II, Int/Ext Acrylic Semi Gloss Finish	121	34	75-400	Drywall, Hard board, Metal, Stucco, Wood	Sheen 60-70 @ 60, highly washable, durable	16 hours
Frazeo, 5230700 Latex Dry Fall Semi Gloss White	118	N/A	100-200	Drywall, smooth wood, metal	Sheen 20-25 @ 60, high hiding, light reflective	2 hours
ICI Paints (ICI Dulux) Ultra-Hide Durus 2416	79	42	300-400	Wood, hardboard	Sheen 40-50 @ 60, mildew resistant, excellent color/gloss retention, durable, tough, moisture resistant, resists peeling, blistering, flaking	4 hours
Innovative Formulations Co. Ecological Paint-Interior/exterior Semi-Gloss	0	N/A	400-450	interior drywall, plaster, concrete, most masonry surfaces, covers properly primed wood & metal	one coat, fast dry, excellent weather-ability, durability, scrub resistance, "hideriffic" technology	2 hours
Innovative Formulations Co. Interior Paint-Mold Not-Semi Gloss	0	N/A	400-450	interior drywall, plaster, concrete, most masonry surfaces, covers properly primed wood & metal, resistance to fungi	one coat, fast dry, strong adhesion, excellent weather-ability, durability, scrub resistance, "hideriffic" technology	2 hours

Rodda, Master Painter Interior Latex Semi Gloss Enamel	133	33	280	Masonry, wallboard, stone, brick, wood	Semi-gloss finish, protects & beautifies	4 hours
Rodda, Unique II Semi Gloss	147	36	280	Wall, trim	Semi-gloss finish, superior washability, durability, resists cracking and deterioration	3 hours
Sherwin Williams, Pro Mar 200 Int Latex Semi Gloss B31W200 Series	85	40	350-400	Walls, ceilings, plaster, wallboard, wood	Sheen 25-35 @ 60, durable	4 hours
Target Coatings, Emtech U9300 Polycarbonate Urethane Top Coat (Semi-gloss)	60	32	500	Boat, automotive interiors	Semi-gloss finish, excellent chemical resistance, weatherability and UV stable	N/A

N/A= Not Available

Nonflats (Semi-Gloss)

50 g/l & Less

Samples 17

Coating Company and Product Name	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal) @3mils	Recommended substrate/ exposure	Coating Characteristics	Drying time to recoat
Benjamin Moore, Eco Spec Int Latex Semi Gloss Enamel 224 1	0	36	400-450	Wood, plaster, masonry, metal	Semi-gloss finish, durable, washable, spatter resistant	2 hours
California, Latex Semi Gloss 663XX	35	39	250-400	Plaster, sheetrock, wallboard, concrete, masonry block, wood, metal	Sheen 40-50 @ 60, extremely durable, anti- spatter, superior leveling, adhesion, color retention & scrubability	2 hours
Color Wheel, Hi-Hide Int Low VOC Latex Wall Paint 5520	1	37	300-500	Concrete, masonry, wood surfaces, gypsum wallboard, Metal, aluminum	Sheen 30-40 @ 60, exceptional hiding, scrubbable, washable	4 hours
Columbia, Purecoat Low Odor Acrylic Semi Gloss 05-572	0	41	360	Wood, drywall, plaster, masonry, concrete, metal	Sheen 55-65 @ 60, excellent spatter resistance, excellent adhesion	12-16 hours
Diamond Vogel Paints, Health-Kote Low Odor Int Semi-Gloss Latex White Base DS-1591	0	34	271-362	Drywall, plaster, masonry, concrete	Semi-gloss finish, durable, excellent washability	12 hours
Dunn Edwards, Sierra Int Acrylic Semi-Gloss Enamel W 550	0	38	350-400	Drywall, masonry, wood, metal	Sheen 50-60 @ 60, excellent hide, good adhesion	2-4 hours
Earthtech, Int/Ext Zero VOC Latex Semi Gloss Enamel	0	34	425	Wood, masonry, metal, plaster, drywall	Semi-gloss finish, excellent durability, color retention, excellent hiding, blister, alkali, fume & fade resistant	4 hours
Frazer, 032 Envirokote Int Low Odor Semi Gloss Finish	20	31	200-400	Concrete, masonry, drywall, hardboard, metal, plaster	Sheen 60-70 @ 60, resistant to abrasion, blocking, washing, yellowing	18 hours
ICI Paints (Corona Paints), Air Care Low Odor Acrylic Semi-Gloss	0	33	450	Wood, drywall, plaster, masonry, metal	Semi-gloss finish, flows easily, excellent hiding power	4 hours
Kelly Moore, 1520 Envirocote Int Acrylic Semi Gloss Enamel	0	36	300	Interior wallboard, plaster, masonry, walls, trims	Sheen 55-65 @ 60, non-polluting	4 hours
Rodda, Horizon Semi Gloss	0	38	305	Interior wallboard, plaster, masonry, stone, brick, wood	Semi-gloss finish, washable, uniform, durable	2 hours
Sherwin Williams, Envirolastic AR530 Brush Grade TRM.81 Semi- Gloss	0	100	100-160	Tank linings, secondary containment, hopper and tank car linings, waterproof deck coatings, industrial floor and wall	Fast cure, No VOC, seamless flexible and waterproof, bridges moving cracks to 1/8", acceptable in USDA inspected facilities	20 minutes-minimum 16 hours -maximum

Sherwin Williams, Envirolastic AR520 SS TRM.88 Semi-Gloss	0	100	6-53	Plaza decks, ramps, stalls, loading docks, bridge decks, waterparks and theme parks, geotextile linings, mechanical equipment rooms, below grade waterproofing	Fast cure, No VOC, seamless flexible and waterproof, bridges moving cracks to 1/8", impact, tear and abrasion resistant, protects against chlorine intrusion	3 minutes-minimum 16 hours -maximum
Sherwin Williams, Envirolastic AR520 PW TRM.91 Semi-Gloss	0	100	6-80	Immersion exposure as a seamless waterproofing liner for fresh and salt water, elevated steel water tanks, concrete water tanks, brine tanks, aquariums	Fast cure, No VOC, seamless flexible and waterproof, bridges moving cracks to 1/8", acceptable for USDA inspected facilities, NSF approved to Std 61 for tanks of 200,00 gallons minimum	3 minutes-minimum 16 hours -maximum
Sherwin Williams, Harmony Int Latex Semi Gloss B-10	0	40	350-400	Block, drywall, masonry, plaster, wood	Sheen 35-45 @ 60, anti-microbial	4 hours
Smiland (Morwear), Int. Semi-Gloss 100% Acrylic Wall & Trim Enamel 190-01	12	44	300-400	Walls, masonry, drywall, plaster	Semi-gloss finish, superior hide, stain resistant, maximum durability	4 hours
Vista Paint, 6400 Earth Coat Semi Gloss	16	39	350-400	Interior drywall, plaster, masonry, concrete, wood	Sheen 48-52 @ 60, resistant to scuffing, staining, abrasion. Excellent hide, touch up, superior adhesion	6 hours

N/A= Not Available

**Nonflats (Low-Gloss)
150 g/l to 50 g/l**

Samples 33

Coating Company and Product Name	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal) @3mils	Recommended substrate/ exposure	Coating Characteristics	Drying time to recoat
Cloverdale, 032 Series Premium Super Eggshell Latex	125	38	350-450	Interior walls, drywall, masonry, plaster	Sheen 20-30 units @ 85 degrees, low spatter, superb flow & leveling	6 hours
Color Wheel, Optima Super Acrylic Satin 100% Acrylic Ext Satin 130	100	37	300-500	Concrete, masonry, stucco, wood, plywood, hardboard, metal, steel, aluminum	Sheen 4-8 @ 60, superior adhesion, excellent resistance to mildew & organic growth, excellent color retention, chalk, alkali resistance, exceptional resistance to blistering, cracking, chipping, peeling, scrubbable, washable	4 hours
Color Wheel, Tropicoat Satin House Paint 100% Acrylic Ext Satin 3400	113	37	300-500	Concrete, masonry, stucco, wood, plywood, hardboard, metal, steel, aluminum	Sheen 5-15 @ 60, superior adhesion, excellent resistance to mildew & organic growth, excellent color retention, chalk, alkali resistance, exceptional resistance to blistering, cracking, chipping, peeling, scrubbable, washable	4 hours
Color Wheel, Weathermaster Satin House Paint Ext Acrylic Latex Stain 3700	81	37	300-500	Concrete, masonry, stucco, wood, plywood, hardboard, metal, steel, aluminum	Sheen 4-8 @ 60, superior adhesion, excellent resistance to mildew & organic growth, excellent color retention, chalk, alkali resistance, exceptional resistance to blistering, cracking, chipping, peeling, scrubbable, washable	4 hours
Color Wheel, Quick Cure Acrylic Ext 1252	129	10	250-400	Stucco, masonry, wood, plywood, hardboard, cement siding, metals, aluminum	Low gloss finish, superior alkali & efflorescence resistant, exceptional penetration, breathable, durable, excellent adhesion	4 hours
Color Wheel, Optima Satin Supreme 230 Int.	146	36	300-500	Concrete, masonry, wood, wallboard, metals, aluminum	Sheen 4-8 @ 60, high hiding, excellent coverage, exceptional resistance to burnishing, extremely scrubbable, washable, non-yellowing	4 hours

Color Wheel, Hi Hide Lustre Int Latex Enamel 440	78	38	300-500	Concrete, masonry, wood, wallboard, metals, aluminum	Sheen 6-10 @ 60, excellent coverage, adhesion, extremely scrubbable, washable, non yellowing	8 hours
Color Wheel, Vina-Glo Int Latex Enamel 480	66	38	300-500	Concrete, masonry, wood, wallboard, metals, aluminum	Sheen 35-45 @ 85, good adhesion, exceptional resistance to burnishing, scrubbable, washable, non-yellowing	8 hours
Diamond Vogel Paints, DE Series Hide Plus Int Eggshell Ltx	123	34	273-364	Interior wood, drywall, plaster, concrete block, masonry	Eggshell finish, durable, outstanding hide, excellent touch up	12 hours
Diamond Vogel Paints, DS-1561 Super Quick 30 Ltx Satin Spray Enamel	107	32	342-513	Ferrous metal, aluminum, interior wood, exterior wood	Satin finish, tough, durable, washable, non- yellowing, good gloss & color retention	2-3 hours
Diamond Vogel Paints, BE-1531 Acri-Satin Ext Acrylic Ltx	104	33	264-352	Ferrous metal, aluminum, interior wood, exterior wood	Satin finish, excellent fade resistance	2-4 hours
Diamond Vogel Paints, BS Series Weather-Plate Ext 100% Acrylic Ltx	101	34	273-363	Ferrous metal, aluminum, interior wood, exterior wood	Satin finish, excellent fade resistance	2-4 hours
Diamond Vogel Paints, BS Series Permacryl Ext Acrylic Ltx	95	38	305-407	Ferrous metal, aluminum, interior wood, exterior wood	Satin finish, excellent fade resistance	2-4 hours
Diamond Vogel Paints, DE Series Permacryl Int Eggshell Enamel	120	36	290-387	Ferrous metal, aluminum, interior wood, exterior wood	Eggshell finish, spatter resistant, excellent hide	2-4 hours
Diamond Vogel Paints, DE-1625 Pro Plus Eggshell Int Ltx White	89	35	185-277	Interior wood, drywall, plaster, concrete block, poured concrete	Eggshell finish, highly durable	4 hours
Dunn Edwards, Tuff-Floor Porch & Deck 810, Int./ext.	145	37	75-200	Wood porches and decks	Sheen 11-15 @ 60, durable, scuff resistant	4 hours
Frazeo, 022 Lo-Glo Interior Acrylic Eggshell Enamel	93	39	250-350	Concrete, masonry, drywall, hard board, metal, plaster, smooth wood	Sheen 8-12 @ 60, excellent hiding, washability	18 hours
Frazeo, 026 Speedsheen Eggshell Interior	114	36	200-300	Concrete, masonry, drywall, hard board, metal, plaster, smooth wood	Sheen 4-7 @ 60, dirt resistant washable	18 hours
ICI Paints (ICI Dulux), Dulux Ultra Eggshell acrylic 1403, interior	112	42	400	Windows, wood trim, cabinets	Sheen 4-10 @ 60, excellent washability, moisture resistance, block resistant, excellent adhesion	3 hours
Kelly Moore, SatN-Sheen Latex 1610, Int.	143	36	300-400	Wallboard, masonry, wood & hardboard	Sheen 7-12 @ 60, durable	24 hours
Kwal-Howells, Accu-Tone Latex Eggshell 1903, Int.	88	34	350	Interior plaster, gypsum board, masonry, concrete, wood, properly prepared metal	Eggshell finish, excellent durability, non- yellowing	4 hours
Life Paint Company, 92 Series High Build Waterproof Smooth Elastomeric Coating	92	46	100	Exterior wall surfaces of masonry, stucco, wood, metal, concrete, block	Sheen 7-10 @ 60, maintains adhesion and flexibility, breathable, resistance to UV	2 hours to touch, 24 hours to recoat
Miller, Pro-Jex Eggshell 1880, Int.	56	34	300-350	Plaster, masonry, wood, metal	Eggshell finish, good adhesion	6 hours
Parker Paint, Pro Satin Latex 5750, Int.	127	38	300-350	Wallboard, concrete	Sheen 2.5 -3 @ 60, high hiding	4-8 hours
Pittsburgh Paints, Speedhide Int Enamel Eggshell Latex	71	39	400-500	Ceilings, primed metal, wallpaper, wood trim, masonry, wallboard, walls	Sheen 4-6 @ 60, high hiding, excellent touch up properties, scrubbable	4 hours
Porter Paints, Int. Latex Wall & Trim Paint 607	115	29	200-400	Wall & trim	Sheen 3-8 @ 60, good hiding, excellent uniformity, washable, non-yellowing	4 hours
Rodda, Master Painter Interior Latex Satin Wall Paint	93	37	295	Masonry, wallboard, stone, brick, wood	Satin finish, protects & beautifies	2 hours
Rodda, Master Painter Interior Latex Low Gloss Wall Paint	112	37	295	Masonry, wallboard, stone, brick, wood	Low-gloss finish, protects & beautifies	4 hours
Rodda, Unique II Low-Gloss Ext/Int Latex Enamel	137	36	290	Wall, trim in kitchen & bathrooms	Low-gloss finish, superior washability, durability	3 hours

Sherwin Williams, ProMar 200 Int Latex Egg-Shel B20W200	142	42	350-400	Aluminum, galvanized steel, block, drywall, plaster, masonry, wood	Sheen 10-20 units @ 85 degrees	4 hours
Sherwin Williams, A-100 Ext Latex Satin A82	112	35	350-400	Aluminum, galvanized steel, block, drywall, plaster, masonry, wood	Sheen of 10-20 units @ 60 degrees	4 hours
Target Coatings, Emtech U9300 Polycarbonate Urethane Top Coat (Low Gloss)	60	32	500	Yacht interiors, automotive interiors, fine tabletops	Satin finish, UV resistant, non-yellowing	2-3 hours
Vista Paint, 8200 Carefree Velvasheen, Int.	148	43	300-400	Drywall, plaster, wood	Sheen 9 @ 60, exceptional stain, dirt resistance, good hide, adhesion	4-6 hours

N/A= Not Available

**Nonflats (Low-Gloss)
50 g/l and less****Samples 19**

Coating Company and Product Name	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal) @3mils	Recommended substrate/ exposure	Coating Characteristics	Drying time to recoat
Benjamin Moore, Eco Spec Int Latex Eggshell Enamel 223, 1	0	36	400-450	Wood, plaster, masonry, metal	Sheen of 8-16 units @ 60 degrees, spatter resistant	2 hours
Color Wheel, Low VOC Int. Latex 5540	1	37	300-500	Concrete, masonry, wood surfaces, gypsum wallboard, ferrous metals, aluminum, galvanized metals	Sheen 15-30 @ 85, high hiding, outstanding touch up, scrubbable, washable, non- yellowing	4 hours
Earthtech, Premium Satin Paint Int.	0	35	425	Plaster, wood, metal, drywall	Satin finish, excellent durability, color retention, excellent hiding, blister, fungus, alkali & fade resistant	4 hours
Diamond Vogel Paints, DE-1591 Health-Kote Low Odor	0	36	285-380	Walls, ceilings, trim	Eggshell finish, excellent washability, durable	12 hours
Dunn Edwards, Int/Ext Latex Low Sheen W 5946	50	37	300-400	Drywall, masonry, interior & exterior wood, metal	Sheen 10-15 @ 60, durable, weather resistant	4 hours
Dunn Edwards, Sierra Int Acrylic Eggshell Enamel W 540	0	38	350-400	Drywall, masonry, wood, metal	Eggshell finish, excellent hide, good adhesion	2-4 hours
EPMAR, Kemiko Col-R-Tone III Acrylic Urethane, Int./Ext.	49	60	300-400	Floors, facades, steel, concrete storage tank exteriors, concrete bridges, pump equipment	Satin finish, resilient, non-yellowing	1 hour
Frazer, 029 Envirokote Int. Low Odor Eggshell	27	34	200-400	Interior walls, ceilings, trim	Sheen 8-12 @ 85, resistant to abrasion, blocking washing, yellowing	18 hours
ICI Paints (Corona Paints), Air Care Odorless Acrylic Eggshell	0	39	450	Wood, drywall, plaster, masonry, metal	Sheen 20-25 @ 85, flows easily, excellent hiding power	4 hours
Innovative Formulations Co. Ecological Paint-Interior/exterior Eggshell	0	N/A	400-450	interior drywall, plaster, concrete, most masonry surfaces, covers properly primed wood & metal	one coat, fast dry, excellent weather-ability, durability, scrub resistance, "hideriffic" technology	2 hours
Innovative Formulations Co. Interior Paint-Mold Not Eggshell	0	N/A	400-450	interior drywall, plaster, concrete, most masonry surfaces, covers properly primed wood & metal, resistance to fungi	one coat, fast dry, strong adhesion, excellent weather-ability, durability, scrub resistance, "hideriffic" technology	2 hours
Innovative Formulations Co. Ecological Paint-Interior/exterior Satin	0	N/A	400-450	interior drywall, plaster, concrete, most masonry surfaces, covers properly primed wood & metal	one coat, fast dry, excellent weather-ability, durability, scrub resistance, "hideriffic" technology	2 hours
Kelly Moore, 1510 Enviro-Cote Int. Acrylic Satin Enamel	0	39	300	Wallboard, plaster, masonry, trim	Sheen 7-12 @ 60, non-polluting	4 hours
Rodda, Horizon Satin	0	37	300	Interior wallboard, plaster, masonry, concrete block, stone, brick, wood	Satin finish, washable, uniform, durable	2 hours

Sherwin Williams, Harmony Int. Latex Eg-Shel B9 Series	0	39	350-400	Drywall, masonry, concrete, cement, block, wood	Sheen 1-20 @ 85, durable, anti-microbial	4 hours
Smiland (Morwear), Int Satin Acrylic Wall & Trim Enamel 180-01	12	44	300-400	Walls, trim, masonry, drywall, plaster concrete, wood, metal	Satin finish, superior hide, stain resistant	4 hours
Union Tank Car Company, Lithcote Aqua-Flex W/B Hopper Car Lining	0	52	834	N/A	Satin finish	N/A
Vista Paint, 6300 Earth Coat Eggshell	15	42	350-400	Interior drywall, plaster, masonry, concrete	Sheen 7-9 @ 60, resistant to scuffing, staining, abrasion	6 hours
Vista Paint, MB30 Aurora Bond II	47	51	300-350	Wood, plywood, drywall, masonry	Sheen 7.4 @ 60, good durability, fade resistant	4 hours

N/A= Not Available

**Primer, Sealer, Undercoater
200g/L –100g/L****Samples 22**

Coating Company, Product Name, Components	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal) @3mils	Recommended substrate/ exposure	Coating Characteristics	Drying time to recoat	Pot Life @70 deg./ Shelf Life
Carboline, Carbocrylic 3359 DTM, 1	110	40	161	Metal Surfaces	Smooth, excellent weatherability, durable, excellent resistance to flash rusting	4 hours	2 years
Carboline, Carbocrylic 3358, 1	153	37	593	Direct to Metal	Smooth, excellent weatherability, durable, excellent resistance to flash rusting	3 hours	2 years
Cardinal, Waterborne Primer Systems	164	41	N/A	Metal Surfaces	Good adhesion, durable	2 hours	N/A
CeRam Kote, Ceram-Thane 100, 1	120	50	800	Direct to Metal	UV light resistant	4 hours	N/A
Columbia, Premium Pro Latex Enamel undercoater 02-735 Int.	120	37	320-400	Interior drywall, masonry	Chemical resistant	2-4hours	N/A
Devoe High Performance Coatings Waterborne Epoxy Primer DEVVRAN 203	107	45	719	Interior or exterior steel, aluminum and certain galvanized metal surfaces, concrete, masonry, glazed brick, ceramic tile	Excellent adhesion, corrosion resistance, good finish coat hiding, low odor, low VOC, easy application	4 hours	N/A
Devoe High Performance Coatings Gloss DTM Waterborne Acrylic Enamel DEVFLEX 659	124	39	156-313	Interior or exterior steel, weathered galvanized steel in institutional, residential and light industrial areas	Direct to metal, low VOC, low odor, fast dry & recoat, resist flash rust, corrosion resistant, high hiding, non-yellowing	4 hours	N/A
Diamond Vogel Paints, DU-1514 PVA Primer Sealer	114	30	23-319	Interior Walls, Ceilings	Fast drying, excellent hold out	4 hours	N/A
Diamond Vogel Paints, DU-1502 Interior Primer Sealer	152	34	272-363	Drywall, plaster, brick, masonry	Alkali resistant	4 hours	N/A
Diamond Vogel Paints, BU Series Weather Plate Primer	151	34	272-362	Wood, hardboard, aluminum	Excellent adhesion	2-4 hours	N/A
Gaco Western Inc., GacoFlex E-5320 Epoxy Primer	111	44	70-100	Masonry block filler	Excellent adhesion	N/A	1-1/2 hours
Gemini, Pro White Waterborne Series	120	36	580	Wood Surfaces	Excellent adhesion	45 minutes	N/A
Kelly Moore, 255-Stain Lock II Primer	140	40	250-400	Bare wood	Chemically absorbent	2 hours	N/A
Life Paint Company, 7075 Acrylic Latex Stain Blocking Busan Primer	125	39	150-200	Concrete, masonry, stucco, Wood, metal, glossy surfaces	Stain blocking, Superior Adhesion	90 minutes	N/A
Parker Paint, Stain Resistant Primer 1833 Acrylic latex Ext.	128	33	165	Concrete, masonry, stucco	N/A	4 hours	N/A

Prosoco, Concrete Science Water Pel Natural Stone	129	5	N/A	Stone, concrete	Good adhesion, durable, water-repellent	4-6 hours	2 years S.L.
Sherwin Williams, DTM Bonding Primer 1.22	51	42	135-335	Pre-finished metal siding, Silicon Polyester, other slick glossy surfaces, previously painted surfaces	Suitable for use in USDA inspected facilities, corrosion resistant	4 hours	N/A
Sherwin Williams, DTM Acrylic Primer/Finish 1.21	138	46	150-290	Steel, Aluminum, Concrete, Galvanizing, Masonry, Zinc Rich Primers	Fast drying, flash/early rust resistant, chemical resistant, suitable for use in USDA inspected facilities	4 hours	N/A
Sherwin Williams, DTM Acrylic Coating 1.25	208	38	155-250	Steel, Aluminum, Concrete, Galvanizing, Masonry, Zinc Rich Primers, Drywall	Fast drying, flash/early rust resistant, chemical resistant, suitable for use in USDA inspected facilities	4 hours	N/A
Sherwin Williams, DTM Wash Primer 1.20A	143	29	250-470	Aluminum, steel	Fast drying, rust resistant	2 hours	N/A
Smiland (Morwear), Primer Xcel Acrylic Stain Blocking Primer 2098 Int/Ext	155	40	212	Wood, masonry, stucco, brick, non-ferrous metal	Stain blocking	4 hours	N/A
United Coatings, Canyon Tone Stain Pigmented Water-Repellent Stain	126	27	50-150	Concrete, brick, stone, stucco	Color stability, ultraviolet resistance, alkali and pollution resistance, water repellent	15 min dry, 1 hour cure	N/A

N/A= Not Available

**Primer, Sealer, Undercoater
100 g/l and less**

Samples 72

Coating Company, Product Name, Components	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal) @3mils	Recommended substrate/ exposure	Coating Characteristics	Drying time to recoat	Pot Life @70 deg./ Shelf Life
Carboline, Carbocrylic 120	72	38	610	Stainless steel, aluminum	Fast drying	24 hours	36 months
Color Wheel, Ti-Guard Sealer 430 Interior Flat	98	29	146	Wall board, plaster, masonry, stucco, wood, plywood	Outstanding resistance to blistering, cracking, chipping, peeling, excellent adhesion	4 hours	N/A
Color Wheel, WaterBorne Undercoat 8300 Interior	73	37	210	Wall board, plaster, masonry, stucco, wood, plywood	Excellent enamel holdout, excellent adhesion	1 hour	N/A
Columbia, Masterpiece Acry-Prime 05-200 Int/Ext	84	42	360	Various Substrates	Stain Blocker	1 hour	2 years
Devoe High Performance Coatings Direct-to-Metal Primer & Flat Finish DEVFLEX 4020PF 4020-1000-white	76	44	275-350	Exterior of tanks, metal buildings, structural steel, piping, handrails, masonry construction	Direct-to-metal or masonry primer, shop applications, low VOC, low odor, resists flash rust, corrosion resistance	2 hours	N/A
Devoe High Performance Coatings Direct-to-Metal Primer & Flat Finish DEVFLEX 4020PF 4020-7100-red	80	44	275-350	Exterior of tanks, metal buildings, structural steel, piping, handrails, masonry construction	Direct-to-metal or masonry primer, shop applications, low VOC, low odor, resists flash rust, corrosion resistance	2 hours	N/A
ICI Paints (Devoe), Catha Coat 305 Water Based Inorganic Zinc Coating	0	61	978	Steel structures, tanks, equipments, piping	Resistance to solvents, good color contrast, resists mudcracking	2 hours	5 hours
Diamond Vogel Paints, DU-1508 Interior Latex Undercoater	56	32	516	Bare Interior Wood Surfaces	Excellent hold out	1-2 hours	N/A
Diamond Vogel Paints, BU Series Sure Grip Acrylic Latex Primer	95	38	305-407	Wood, hardboard, aluminum, masonry	Outstanding adhesion	2-4 hours	N/A
Dunn Edwards, High Hide PVA Sealer W 5827	60	36	300-400	Drywall	Excellent hiding power	4 hours	N/A
Dunn Edwards, Production Latex Wall Sealer W 2397	60	28	250-300	Drywall, plaster	Good hide	4 hours	N/A
Dunn Edwards, Ultra Grip Acrylic Multi Purpose Primer W 715	45	41	400	Interior, exterior, wood	Outstanding stain blocking, excellent enamel holdout, great hide	4-6 hours	N/A

Dunn Edwards, Production Latex Undercoater W 2400	75	40	400	Interior, synthetic wood, hardboard	Good hide, adhesion & enamel hold out	2 hours	N/A
Dunn Edwards, Sierra Low Odor, Interior Sealer Undercoater W 500	0	38	300-400	Drywall, masonry, wood, hardboard	Good hide, adhesion, & enamel holdout	2 hours	N/A
Dunn Edwards, Vinylastic Interior Pigmented Sealer W 101	60	37	300-400	Drywall, plaster, masonry	Good hide, adhesion, & enamel holdout	2-4 hours	N/A
Dunn Edwards, Proseal Interior Pigmented Sealer W 102	55	30	250-300	Drywall	Enamel holdout	2-4 hours	N/A
Dunn Edwards, EFF-Stop Acrylic Masonry Primer/Sealer W 709	100	34	200-400	Concrete, stucco, block	Alkali Resistant	2-4 hours	N/A
EPMAR, Kemiko Clear Acrylic Urethane, 1	50	30	300-400	Concrete, plaster, wood, FRP, GFRC, metals	Stain resistant	1 hour	N/A
EVR-Gard Coatings, 95 Busan Vinyl Acrylic Wood & Metal Primer	77	38	300-400	Wood, masonry, metal	Retards bleed through of tannins, resins	4-5 hours	N/A
EVR-Gard Coatings, 64 Quick Dry Latex Enamel Undercoat	60	56	300-350	Exterior Wood	Good adhesion	2 hours	N/A
EVR-Gard Coatings, 63 Unikote Latex Enamel Undercoat	97	37	300-400	Wood, masonite	Extremely tough	4 hours	N/A
EVR-Gard Coatings, 103 Evrcare Primer Sealer	0	N/A	350-400	All interior surfaces	Excellent hiding power	4-6 hours	N/A
Farwest, X-6791 Aquashield II Waterborne Resistant Rust	76	39	300-400	Metal Surfaces	Fast drying	1-3 hours	N/A
Farwest, MIL-P-28577B Fast Dry Red Oxide Primer	89	32	300-400	Metal shops	High quality, water resistant, corrosion resistant	1-3 hours	N/A
Farwest, TT-P-650C Proseal PVA Primer Sealer Interior	27	32	300-500	Interior Wallboard	Adheres well, non-flammable	1-3 hours	N/A
Farwest, #5085 Latex Acrylic Primer (Exterior)	46	34	200-400	Exterior wood, masonry surfaces	Good blocking resistance	2-4 hours	N/A
Farwest, X-6785 Aquashield II Fast Dry Red Oxide Shop Primer	76	39	300-400	Metal Surfaces	Water, corrosion resistant	3 hours	N/A
Farwest, #700 Wonderblok Stain Blocker Fast Dry Acrylic Primer Sealer	82	42	300-400	Tile, hardboard, plastic laminate, metal surfaces	Water blocking	2 hours	N/A
Farwest, #5030 Block Filler Latex Int/Ext	25	28	100-150	Cement walls, cinder block	Withstands moisture	18 hours	N/A
Farwest, X-6762 Aquashield II Fast Dry Red Oxide Primer	89	35	300-400	Metal shop applications	Good emulsion	1-3 hours	N/A
Farwest, #970 Proseal PVA Primer Sealer (Interior)	27	32	300-500	Interior Wallboard	Good emulsion	1-3 hours	N/A
Frazeo, 172 Grip-N-Seal Acrylic primer Int/Ext.	96	33	100-300	Various substrates	Stain blocking	2-3 hours	N/A
Frazeo, 168 Prime Plus Int/Ext Acrylic Primer Sealer Stain Killer	58	44	200-400	Concrete, drywall, plaster, metal, wood	Top quality, resists alkali on concrete	3-4 hours	N/A
FUHR, ZVOC Wax Seal & Finish	0	32	N/A	Interior & Exterior Wood Substrates	Early block resistance	20 minutes	N/A
Global EcoTechnologies, Inc. Endura-Flex 1200P Epoxy Primer Sealer	0	100	1604	Steel and porous substrates	For exposure to chemical and physical environments found in water and water treatment industries	When wet or tacky to touch	40-50 minutes
Global EcoTechnologies, Inc. Endura-Flex 550 Primer/Sealer	0	45	540	Porous substrates such as concrete, asphalt, and wood	For exposure to chemical and physical environments found in water and water treatment industries	30 minutes	N/A
Global EcoTechnologies, Inc. Endura-Flex 19P Filler/Surfacer	0	80	12.8	concrete and masonry	Very high build and can be applied by either spray or trowel	1 hour or less	N/A
Glitsa American, Inc., Infinity Sealer	85	30	500	Wood Floors	Fast drying	1-3 hours	N/A

ICI Paints (Color Your World), 8791 Acrylic Blokker Int/Ext	97	49	68	Wood, plaster, drywall, concrete, stucco, masonry	Stain Blocker	2 hours	N/A
ICI Paints (ICI Dulux), Dulux Pro Acrylic Primer 2000, Exterior	95	51	300-500	Exterior wood, concrete, masonry, non-ferrous metal	Mildew resistant	1 hour	1 year
ICI Paints (ICI Dulux), Ultra Hide Aquacrylic Gripper 3210	95	50	300-450	Wood, masonry, previously painted surfaces, galvanized metal, aluminum	Blocks stains, high hiding, sealing, excellent adhesion, moisture and alkali resistant	1 hour	1 year
ICI Paints (ICI Dulux), Ultra-Hide PVA primer/sealer 1030, int.	96	27	40	Drywall, concrete block, brick	N/A	2 hours	1 year
International Protective Coatings, Intercryl 520 Waterborne Acrylic	43	44	353	Metal, concrete, wood	Rust inhibitive	2 hours	N/A
International Protective Coatings, Intergard 270 Waterborne Acrylic	47	50	267	Steel surfaces	Anti-corrosive	3 hours	N/A
Insl-X Superior Coating Systems Rust Arrestor RA-0104	90	26	208	Rusted areas where sandblasting is not acceptable, repair and maintenance of existing systems	Chemically converts tightly adhered rust to a black iron complex thus stopping the corrosion mechanism	2 hours	N/A
KST (Snow Roof Systems), Elasto Seal	1	N/A	100	Tar, metal roofs, basement walls	Excellent mildew resistance	24 hours	N/A
KST (Snow Roof Systems), Safe-T-Prime	1	N/A	100	Tar, metal roofs, basement walls	Excellent mildew resistance	24 hours	N/A
Kwal-Howells, Pro-Finish Acrylic primer 5860 Int./ext.	77	43	250-350	Wood, concrete, plastic, hardboard, metal, drywall	Alkali Resistant	4 hours	N/A
Pittsburgh Paints, Seal Grip 17-21	96	38	400-500	Aluminum, Masonry, Stucco, Wood, Metal, Plaster, wallboard	Exceptional adhesion	1 hour	N/A
Rodda, Heavy Body Scoteseal, Interior	87	41	330	Primer under alkyd or emulsion finishes on drywall	N/A	2-3 hours	N/A
Rodda, Roseal Pigmented Vinyl Acrylic	83	26	300	Primer under oil type, emulsion paints	Very fast drying	2-4 hours	N/A
Sherwin Williams, PrepRite 200 Int Latex Primer B28W200	86	28	400	Drywall, masonry, concrete	Excellent coverage, excellent drywall sealer	4 hours	N/A
Sherwin Williams, Armorseal 33 Epoxy P/S	0	100	200	Industrial, commercial, marine applications	Fast drying, excellent adhesion, abrasion resistance, chemical resistant	1 day	N/A
Sherwin Williams, Armorseal WB Epoxy P/S (8.20)	20	87	200	Concrete, masonry	Abrasion resistant, excellent adhesion, fast dry, chemical resistant	2 days	N/A
Sherwin Williams, Corobond 100 Epoxy P/S	13	13	98	Concrete surfaces	Fast dry, superior penetrating characteristics	1 month	N/A
Sherwin Williams, Corobond LT Low Temp Epoxy (TRM.72)	0	100	200-400	Concrete, masonry	Blush resistant, low temp cure, moisture tolerant cure	18 hours	18 months
Sherwin Williams, Prep Rite 400 Interior Latex Primer B28W400	51	31	350-400	Drywall, masonry, concrete, previously painted surfaces	Good drywall sealer	4 hours	N/A
Sherwin Williams, Sherthane High Performance Moisture Cured Urethane Sealant	48	97	N/A	Wide variety of substrates	Fast cure, remains flexible, excellent exterior durability, superior adhesion	24-48 hours	9 months
Sherwin Williams, Color-Prime Int Latex Primer Deep Tinting Base	95	28	350-400	Drywall, masonry, concrete, previously painted surfaces	Excellent hiding primer, excellent coverage, excellent drywall sealer	4 hours	N/A
Sherwin Williams, SuperPaint Machine Finish Latex Primer B42W700	59	36	200-400	Plywood, cement, wood	Mildew resistant, tough, durable, moisture, resistant	2 hours	N/A
Sherwin Williams, PrepRite ProBlock Int/Ext Latex P/S B51	99	36	400	Drywall, ceiling tiles, PVC piping, cured plaster, paneling, wall laminate, galvanized metal, wood, aluminum, hardboard	Fast drying, good adhesion	1-4 hours	N/A
Sherwin Williams, PrepRite High Build Int Latex Primer/Surfacer B28W601	71	25	400	Drywall, cured plaster, under decorative texture finishes	Ensures coat will be smooth, minimizes minor surface imperfections	4 hours	N/A

Sherwin Williams, PrepRite Classic Int Latex Primer B28W101	90	42	400	Drywall, cured plaster, textured walls, aluminum, wood, pre primed metal, galvanized metal	Quick drying, fast sanding, excellent coverage, quality sealer under wallcovering	2 hours	N/A
Sherwin Williams, PrepRite Bonding Primer Int/Ext Adhesion Promoting Primer B51W50	41	44	350-400	Metal, aluminum, steel copper, drywall, tile, glass, concrete, masonry	Excellent adhesion	4 hours	N/A
Sherwin Williams, Prep Rite 200 Interior Latex Primer B28W200	86	30	400	Drywall, concrete, masonry	Excellent coverage, excellent drywall sealer	4 hours	N/A
Sherwin Williams, Harmony Int Latex Primer B11W900	0	35	350-400	Apartments, department stores, office buildings, residences, supermarkets, hotel rooms, nursing homes, schools, hospitals	Anti-microbial, very low odor	4 hours	N/A
Sherwin Williams, Latex Primer A-100 Ext.	89	38	350-400	Wood and plywood	Mildew Resistant	4 hours	N/A
Sierra Corp (TK Products), TK-709 Ultra Release	85	N/A	600-1800	Concrete	Excellent slip agent	N/A	N/A
Sierra Corp (TK Products), TK-5334 VOC, 2	42	N/A	600-1800	Wood, metal, fiber glass, paving equipment	Rust preventative	N/A	N/A
Smiland (Morwear), Primer Xcel Quick Grip Int/Ext Quick Dry Enamel Undercoater 4077	63	40	200-400	Walls, masonry, drywall, plaster, concrete, brick, hardwood	Stain blocking	2 hours	N/A
Zehrunge, Z-Prime II	5	54	N/A	N/A	Non-flammable	N/A	N/A
Zinsser, Bulls Eye 123 W/B Primer sealer	100	N/A	400-450	Various Substrates	Stain killer	N/A	N/A

N/A= Not Available

**Quick Dry Enamels
400g/l to 150 g/L**

Samples 5

Coating Company, Product Name, Components	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal) @3mils	Gloss Characteristics	Recommended substrate/exposure	Coating Characteristics	Drying time to recoat
Ellis, Hy-Lux W/B Ind. Ena. Yellow 1219	250	30-32	165	80	Wide variety of substrates including, but not limited to steel, plastic, wood	Excellent adhesion	1-2 hours
Ellis, W/B Ind. Acry. Ena. Med. Green 1225	244	30-32	165	80	Wide variety of substrates including, but not limited to steel, plastic, wood	Excellent adhesion	1-2 hours
Vanex, Inc., Breakthru GLS-Pastel BS	215	N/A	N/A	N/A	N/A	N/A	N/A
Vanex, Inc., Breakthru Satin-Clear	249	N/A	N/A	N/A	N/A	N/A	N/A
Vanex, Inc., Breakthru Sat-Wrtimbk	242	N/A	N/A	N/A	N/A	N/A	N/A

N/A= Not Available

**Quick-Dry Primer, Sealer,
150 g/l and less**

(Numerous coatings listed in Primer, Sealer, Undercoater meet the dry time and gloss requirements of a Quick-Dry PSU)

Samples 41

Coating Company and Product Name	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal) @3mils	Recommended substrate/exposure	Coating Characteristics	Drying time to recoat	Pot Life @70 deg./ Shelf Life
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ADCO, PUR-100 Polyurethane Sealant, 1	80	N/A	N/A	Metals, glass, aluminum, plastic	Good adhesion, fast cure, paintable, low odor	N/A	1 year
ADCO, PUR-200 Sealant/ Adhesive	72	N/A	N/A	Metals, glass, aluminum, plastic	Good adhesion, fast cure, paintable, low odor	N/A	9 months
Ameron, Amerlock Sealer 100% Solids Epoxy Sealer	0	100	1069	Steel, old coatings	Non yellowing	N/A	2 hours
Carboline, Waterborne Acrylic	115	39	593	Steel	Good adhesion	N/A	2 years
CeRam Kote, CeRam Floor Primer	0	100	800	Unsealed concrete	N/A	N/A	N/A
Color Wheel, Optima All Prime 330, 1	115	35	300-400 @ 1.6mils	Concrete, masonry, wood, hardboard, aluminum, metals, wallboard, ceilings, fiberglass	Excellent adhesion, excellent alkali, efflorescence resistance, resistant to blistering, cracking, chipping, peeling, mildew resistant, outstanding stain blocking, excellent chalk resistance, resistant to moisture	4 hours	N/A
Color Wheel, Ti-Gard Latex Conditioner 1250	75	20	300-500	Masonry, stucco, plaster, wood, ferrous metals, aluminum, galvanized metals	Remarkable resistance to blistering, cracking, chipping, peeling, excellent adhesion, low odor, rapid dry	4 hours	N/A
Columbia, Econo Vapor-Barrier Latex Primer 02-724	110	28	200	Interior walls, ceilings	Superior resistance to highly alkaline substrates	2-4 hours	N/A
Davlin, Butylseal 572, 1	7	N/A	75-250	Wood surfaces, masonry surfaces	Good flexibility, adhesion	24 hours	N/A
Diamond Vogel Paints, MC Series V-Cote 200 Acrylic	91	39	626	Steel, metal, wood, aluminum, masonry	Outstanding adhesion, rust inhibitive, fade resistant	2-4 hours	N/A
Diamond Vogel Paints, BU Series Sure Grip Acrylic Latex Primer	95	38	610 @ 1 mil	Wood, hardboard, aluminum, masonry	Outstanding adhesion, stain blocking	2-4 hours	N/A
Frazeo, 065 Acry-Prime Undercoater	86	37	200-400	Concrete, masonry, wood, hardboard, metals, plaster, drywall	Excellent quality, fast drying, high hiding	3-4 hours	N/A
Frazeo, 061 Aqua Seal Interior Vinyl Acrylic Wall Sealer	106	29	125-350	Drywall, concrete, masonry, plaster, wood, hardboard	Good adhesion	2 hours	N/A
Frazeo, 266 Epotilt Exterior Epoxy Acrylic Concrete Sealer	80	40	100-350	Block, concrete	Exceptional adhesion, resists alkali	12 hours	N/A
Frazeo, 066 Envirokote Primer	4	42	100-400	Concrete, masonry, drywall, plaster, hardboard, metal, wood	Top of the line quality	2-3 hours	N/A
ICI Paints (Glidden), Ultra Hide Aquacrylic Gripper GL 3210	95	50	300-450	Wood, masonry	Blocks stains, high hiding, excellent sealing, excellent adhesion & hide	1 hour	1 year
Insl-x, Prep-A-Wall WP-3000	115	28	N/A	Existing wall coverings	N/A	2 hours	N/A
Kelly Moore, Enviro-Cote Interior Acrylic Primer	87	35	250-350	Undercoating for wood, masonry, wallboard, plaster	Excellent spot primer	1 hour	N/A
KST (Kool Seal), Kool-Lastik Primer 34-600	41	N/A	25-100	Modified bitumen, rolled roofing, bonded tar and gravel, asphalt/fiberglass shingles, built- up roofs, most asphaltic surfaces, ponded water areas, flat roofs	Heavy duty coating, improves topcoat adhesion	N/A	N/A
Resene, D45 Quick Dry Acrylic Primer Undercoater	31	N/A	12.5	Wallboard, particle & chipboard, cement plaster, block, brickwork, wallcoverings	Good chemical, solvent resistance, excellent durability, excellent adhesion, excellent flow & sanding properties	2-4 hours	N/A
Rodda, Flat Acrylic Primer Sealer	100	38	300	Concrete, stucco, masonry, drywall, hardboard	Smooth, flat	3 hours	N/A
Rodda, Moisture Vapor Barrier Coating	108	30	260	Interior walls	Smooth, flat	30 minutes	N/A

Rodda, Lasyn Enamel Undercoat	108	42	360	Wood surfaces	Flat sandable finish	2 hours	N/A
Samuel Cabot, Exterior White Primer	31	100	N/A	Wood surfaces	Tough, durable	N/A	N/A
Sherwin Williams Illusions Crackle Medium A46T100	0	18	100	Drywall, steel, masonry, concrete, block, plaster wood	Rich finish	4 hours	N/A
Sherwin Williams, DTM Bonding Primer B66A50	51	42	135-335	Metal siding	Corrosion resistant	8 hours	36 months
Sherwin Williams, Moisture Vapor Barrier B72W1	35	24	200-250	Walls, ceilings	Reduces loss of moisture	4 hours	N/A
Sherwin Williams, PrepRite Pro Block Int/Ext Latex P/S B51	99	36	400	Drywall, ceilings, PVC piping, plaster, paneling, metal, wood, aluminum, hardboard	Good adhesion, fast drying	4 hours	N/A
Sierra Corp (TK Products), TK-5334 WB, 2	54	N/A	600-1800	Wood, metal, fiber glass, plastic	Prevents rust, corrosion, & deterioration	N/A	N/A
Sierra Corp (TK Products), TK-709 Ultra Release	85	N/A	600-1800	Wood, metal, fiber glass, plastic	Excellent slip agent, prevents rust, corrosion	N/A	N/A
Smiland (Morwear), Exterior 100% Acrylic Surface Primer 2099	98	31	300-400	Stucco, concrete, block	Excellent adhesion, alkali resistant, quick drying	4 hours	N/A
Smiland (Morwear), Interior PVA Acrylic High Build Primer 1877	100	26	250-350	Plaster, concrete, brick, tile, drywall	Formulated for extra hide, quick drying, easy to apply	4 hours	N/A
Smiland (Morwear), Primer Xcel Quick Grip Int/Ext Quick Dry Enamel Undercoater 4077	63	40	200-400	Plaster, concrete, brick, hardboard, wood	Quick drying, excellent adhesion, sandable, good enamel holdout	2 hours	N/A
Target Coatings, Emtech 8800 Sealer	50	40	500	Paneling, wood	Excellent color tone generation	1 hour	N/A
Tropical Asphalt Products Corp, #980 Eternalastic Acrylic Asphalt Primer	36	100	200	Roofs, metal surfaces	Smooth, flat	N/A	N/A
United Coatings, Canyon Tone Stain Pigmented Water-Repellent Stain	126	27	50-150	Concrete, Fiber, block, brick, stucco	UV resistant, alkali resistant, superior color stability	1 hour	N/A
Vista Paint, 190 Uniprep	35	30	298	Pre-painted plastic, metals, glass, aluminum	Good adhesion	24 hours	1 year
Vista Paint, 4000 Uniprime	50	41	350-375	Pre-painted metals, glass aluminum and plastic	300 psi Tensile strength	24 hours	9 months
Vista Paint, 4200 Terminator II	50	42	300-375	Wood or paneling, commercial architectural finishes, yacht interior	Non-combustible	1 hour	1 year
Vista Paint, 6000 Earth Coat Primer	18	39	350-500	Masonry, drywall, concrete, plaster, wood	Superior adhesion, excellent base	2-4 hours	N/A
Vista Paint, XP11A Aqualac Industrial Wood Undercoat	70	40	300-500	Interior wood	Fast drying, sandable	1 hour	N/A

N/A= Not Available

Roof
250 g/l or less **Samples** **88**

Coating Company and Product Name	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal) @ mil	Recommended substrate/exposure	Coating Characteristics	Drying time to recoat	Pot Life @70 deg./ Shelf Life
Base Coat							
Innovative Formulations Co. Mirorseal Superior Roofing System	0	41	3 sf/lb	Roofing System	Easy application, adhesive sealant, High Strength to weight, fire resistant, embrittlement resistant, moisture proof	Gel Time: 1 hour Dry Time: 4 hours	N/A

Henry, #201 Fibered Asphalt Roof Coating	250	N/A	50	Smooth-surface, granulated cap sheets, build-up-roof systems, SBS modified or composition roofs, metal roofs for rust prevention.	Provides tough, curable, weather-resistant film, solvent allows low temperature application, won't wash off if unexpected rain, cold-applied.	N/A	N/A
Tropical Asphalt Products Corp. #202 Fibered Roof Coating Asbestos Free	250	N/A	33-50	Felt, mineral cap sheets, existing composite shingle roofs	Durable, waterproof, flexible, wrinkle and blister resistant	48 hours	N/A
Henry, #826 Rubberkote Base Coat	200	45	100 @ 22	EPDM roofs	Good adhesion, resistant to ponded water, seamless, highly reflective	24 hours to recoat	N/A
Life Paint Company, 8875 Elastomeric Waterproofing Underseal	101	42-45	50 @ 14	Composition roofs, asphalt shingles, metal, concrete, flat roofs, rolled roofs, poly foam roofs, mobile homes, plywood roofs & decks, flower pots, masonry block walls	Primes and seals, resists ponding water, creates a water barrier, resists cracking, superior flexibility and tensile strength	N/A	N/A
Insl-x, Rust Arrestor, RA-0104,	90	26	208@2	For rusted metal where sandblasting is not acceptable	Turns black over rust, vinyl/acrylic lates, stops corrosion	2 hours to touch, 4 hours to recoat	N/A
Tropical Asphalt Products Corp, #360 Asphalt Emulsion	30	N/A	33-50	Built-up roofing, metal, masonry, pipes and tanks above or below ground level	Waterproof, resists corrosive fumes, sag and crack resistant	6-24 hours	N/A
Tropical Asphalt Products Corp, #363 Fibered Asphalt Emulsion Asbestos Free	30	N/A	25-50	Built-up roofing, metal, masonry, pipes and tanks above or below ground level	Waterproof, resists corrosive fumes, sag and crack resistant	6-24 hours	N/A
Tropical Asphalt Products Corp, #365 Modified Asphalt Emulsion	30	N/A	33-50	Built-up roofing, metal, masonry, pipes and tanks above or below ground level, SBS modified, APP modified	Waterproof, resists corrosive fumes, sag and crack resistant	6-24 hours	N/A
Tropical Asphalt Products Corp, #367 Neoprene Modified Emulsion	30	N/A	33-50	Built-up roofing, metal, masonry, pipes and tanks above or below ground level, SBS modified, APP modified	Waterproof, resists corrosive fumes, sag and crack resistant	6-24 hours	N/A
Western Colloid, Elastomeric Asphalt Emulsion #298E	13	45	10 to 33	Smooth or mineral surfaced build-up roofing, metal roofing, masonry, stucco, parapet walls, curbs, base flashings, below grade walls, most exterior metal surfaces	Resists checking and cracking; flexible; enhances resistance to industrial pollutants, contaminants, and corrosives; allows surface to "breathe"	12 hours firm set	N/A
United Coatings, Roof Mate Base Coat	5	60	Mar-00	Metal, concrete, foam insulation, modified bitumen, composite shingle roofs	Good adhesion, durability, fire retardant, resists mildew, waterproof	N/A	N/A
Henry, #100 Elastomulsion	4	N/A	34	Most roof surfaces, metal and masonry	Acrylic modified elastomeric, corrosion resistant, waterproof, cold applied.	6 to 24 hours when hot, 2 to 7 days when cool & damp.	N/A
Henry, #297 ElastoBlack	4	55	34 @ 48	Roof, metal and masonry surfaces	Corrosion resistant, waterproof, cold applied	6 to 24 hours when hot, 2 to 7 days when cool & damp.	N/A
Gardner-Gibson, Inc. (APOC), 300 Non-Fibered Asphalt Emulsion	0	N/A	50	Coating built-up, mineral surfaced, metal, concrete, corrugated and other roof surfaces	Excellent weatherability, non-flammable, odorless, bonds to damp or dry surfaces, damp-proofing	4-8 hours to recoat	N/A
Gardner-Gibson, Inc. (APOC), 302 Fibered Asphalt Emulsion	0	N/A	50	Coating built-up, mineral surfaced, metal, concrete, corrugated and other roof surfaces	Excellent weatherability, non-flammable, odorless, bonds to damp or dry surfaces, damp-proofing	4-8 hours to recoat	N/A
Gardner-Gibson, Inc. (APOC), 337 Elastomeric Asphalt Emulsion	0	N/A	50-75	Virtually any type of roof surface including bitumen, built-up roofing, asphalt, shingles, metal, concrete, old tar roofs	Watertight, resists peeling, resists cracking, resists checking	4-8 hours to recoat	N/A

Gardner-Gibson, Inc. (Gardner), 042-GA, Non-fibered Emulsion Roof Coating	0	N/A	50	Built-up ply sheets, mineral surfaced cap sheets, other asphalt roof surfaces	Damp-proofing, excellent weatherability, non-flammable, odorless, bonds to damp or dry surfaces	4-8 hours to set, 24-48 days full cure	N/A
Gardner-Gibson, Inc. (Gardner), Aqua Tec Roof & Foundation Coating	0	N/A	50	Built-up, metal, concrete, corrugated, mineral surfaced, other roof surfaces	Damp-proofing, excellent weatherability, non-flammable, odorless, bonds to damp or dry surfaces	4-8 hours to set, 24-48 days full cure	N/A
Henry, #107 Asphalt Emulsion	0	N/A	60	Most roofs, septic tanks, planters	Corrosion resistant, does not crack, cold applied	6 to 24 hours when hot, 2 to 7 days when cool & damp.	N/A
Henry, #307 Fibered Asphalt Emulsion	0	N/A	25-34	Roof, metal and masonry surfaces	Corrosion resistant, waterproof, cold applied	6 to 24 hours when hot, 2 to 7 days when cool & damp.	N/A
Western Colloid, Product #298 Asphalt Emulsion Roof Surfacing	0	40	10 to 33	Smooth or mineral surfaced build-up roofing, metal roofing, masonry, stucco, parapet walls, curbs, base flashings, below grade walls, most exterior metal surfaces	Resists checking and cracking; flexible; enhances resistance to industrial pollutants, contaminants, and corrosives; allows surface to "breathe"	12 hours firm set	N/A
Reflective and Other Topcoats							
Andek, Silver Film	250	N/A	360@3	May be installed over flat roof system, good adhesion to most metals including rusted or corroded, asphaltic or coal tar pitch roofs.	Thermoplastic resin, air drying, highly reflective, high solids	12 to 24 hours	N/A
Andek, Polaroof R.A.C.	200	N/A	40 @30	All kinds of roofing, Aluminum, tin, corrugated steel, concrete, urethane foam, EPDM and other rubber roofs	All climatic extremes, protects against UV, puncture resistant up to 120 psi, moisture cure, flexible at low temperatures, won't get hard or crack with age, corrosion-inhibiting pigments, aluminum flake.	24 hours to walk on	N/A
Henry, #299 Premium White Elastomeric Roof Coating	200	62	80 @ 18	Previously coated white or aluminum roof surfaces, mineral surface cap sheet, smooth surface BUR, SBS, AND APP roofs.	Water-based acrylic latex, mildew, algae, fungi, chalking and disbonding resistant, 2 coats recommended.	Dry between coats same day application	N/A
Henry, #275 White, #276 Gray, MetalShield WB Elastomeric Roof Coatings	200	45	67 - 100	Metal roofs	Elastomeric polymer latex based, requires two applications (gray then white)	2 hours to touch, 24 hours to recoat	N/A
Henry, #827 Rubberkote Topcoat	200	53	100 @22	EPDM roofs, suited for application over Hypalon® membranes.	White elastomeric, Good adhesion, resistant to ponded water, seamless, highly reflective.	2 hours to touch	N/A
Andek, Polaroof RAC-OZ, 2	160	N/A	50@30	Designed where strength, chemical and oil resistance, and a totally waterproof surface are required.	All climates and exposure, oxazolidone chemistry (isocyanate groups), rubber-like finish, highly solar reflective, UV resistant, withstands constant water immersion.	N/A	N/A
Benjamin Moore, Moorcraft Roof Spec Latex Semi-Gloss Finish 141	150	27	200-300	For new or previously painted roofs of asphalt, concrete, slate, cement and clay tile, previously painted metal roofs	Good adhesion, mildew resistant, easy to apply, resists peeling and blistering, fume resistant	1 hour to touch, 6-8 hours to recoat	N/A
Life Paint Company, 88-20 Elastomeric Roof Coating	133	N/A	50 @ 14	Composition roofs, rolled roofing, asphalt shingles, foam roofs, metal roofs, mobile homes	Durable, flexible, solar deflection of 80%, resists the ponding of water	8 hours for initial cure, 24 hours to recoat	N/A
CIM, CIM 800, 2	111	86	N/A	For roofing, concrete, steel, glass, wood, previous coatings and linings	Weather durable, self adhering, 45 minute pot life	1 hour	N/A
Western Colloid, Aluminum Reflective Roof Coating "Silverwhite" #525	109	40	67	For metal, smooth BUR, mineral surface, emulsion, and Glas Shield roof systems	Excellent weatherability, elongation and tensile strength, flexibility, 76% reflective, reduces UV degradation	1 hour	N/A

Benjamin Moore, Moorcraft Roof Spec Latex Flat Finish 140	100	40	200-300	For new or previously painted roofs of asphalt, concrete, slate, cement and clay tile, previously painted metal roofs	Good adhesion, mildew resistant, easy to apply, resists peeling and blistering, fume resistant	1 hour to touch, 6-8 hours to recoat	N/A
Henry, #281, #282, #284 and Custom Elastomeric Roof Coating	100	53	50 @ 18	Most roof surfaces, stucco & masonry parapet walls.	Water-based acrylic latex, mildew, chalking, disbonding resistant	2 coats same day application	N/A
Henry, #280 White Elastomeric Roof Coating	100	53	50 @ 18	Most roof surfaces, stucco & masonry parapet walls.	Water-based acrylic latex, mildew, chalking, disbonding resistant; highly reflective, UV protection	2 coats same day application	N/A
Henry, #287 Solar Flex White Roof Coating	100	42	100	Most roof surfaces, stucco & masonry parapet walls.	Water-based acrylic latex, highly resistant to disbonding, chalking, mildew, discoloration, highly reflective, UV protection, 2 coat application	2 hours to touch	N/A
Tropical Asphalt Product Corp, #901 Standard White Elastomeric Roof Coating	100	44	100	All types of roofs	Highly reflective, flexible, durable, weather, UV resistant, good adhesion	4 hours to recoat 24-48 hours cure	N/A
Tropical Asphalt Product Corp, #911 Eternalastic White Elastomeric Roof Coating	100	59	100	All types of roofs	Superior adhesion, flexible, highly reflective, resists mold and mildew	4 hours to recoat 24-48 hours full cure	N/A
Tropical Asphalt Product Corp, #921 Reflex White Elastomeric Roof Coating	100	44	100	All types of roofs	Highly reflective, flexible, durable, weather resistant, UV resistant, fast drying	4 hours to recoat 24-48 hours full cure	N/A
Tropical Asphalt Products Corp, #113 Hydro Aluminum	100	N/A	35-100	Metal, smooth BUR, mineral surface, emulsion, composition shingle, and modified roof systems	Durable, excellent elongation and tensile strength, 55% reflective	N/A	N/A
Dunn Edwards, Stay Kool Roof Coating W 2456	85	36	50-75 @17 wet	For asphalt and polyurethane foam roofing primed wood, masonry and metal	Increases light reflection, water-sensitive for 72 hours	1 hour to touch, 24 hours to recoat	N/A
ICI Paints (Dulux), Rooflex Top Coat SA10XX	81	50	60	For built-up roof, gravel roof, galvanized steel, concrete, urethane foam roofing, wood and composition shingles	Durable, weatherable, excellent elongation properties, resists cracking, dirt pick-up resistance	2 hours to touch, 8 hours to recoat	N/A
ICI Paints (Devoe), Devflex 4020PF Direct to Metal Primer & Flat Finish, 4020-1000 white, 7100 red	76-80	44	275-350	For metal buildings, galvanized steel, aluminum	Water-borne acrylic primer, mildew resistant, resists flash rust, corrosion resistant, flexible	30 min. to touch, 2 hours to recoat	N/A
Farwest, #5500 Wonderflex Elastomeric Acrylic Coating	75	49-51	65-70	For wood, concrete or metal surfaces and roof surfaces such as asbestos asphalt tile, hot-mopped tar, elastomeric aluminum, galvanized metal roofs, and fiberglass and wood shingles	Sun reflective, excellent adhesion, resistant to salt water spray and pooling water	1 hour to touch, 18 hours to recoat	N/A
Anchor Coatings, Natural Sealant 104	73	22	100-250	Asphalt roofing, fiberglass roofing, shingle roofing, fiberglass skylights, natural or pre-painted wood surfaces, concrete, brick, stucco, tile roofs, stone, aluminum, and metal surfaces	Water-repellent, resists UV exposure, resists mold and fungus growth	1 hour to touch, 4 hours to recoat	N/A
BLP Mobile Paints, Elastomeric Roof Coating Reflective White 43-25	71	49	50@15	Aluminum, weathered galvanized metal, wood, asphalt shingles, built-up roofs, urethane foam, concrete, well bonded gravel roofs and cement tiles	acrylic emulsion, reflective, flexible, resist mildew, superior weatherability	1 hour to touch, 24 hours to recoat	N/A

Smiland (Morwear), Cool Life Acrylic Latex Flexible Roof Coating 870-00	66	45	50-100	Most flexible roof surfaces such as composition shingles, fiberglass shingles and urethane foam. Also roofs of loose gravel, masonry shingles, aluminum roofs, galvanized roofs and mobile home roofs	Reflective, very flexible, acrylic latex, extremely adhesive	30 minutes to touch, 6 hours to recoat	N/A
Dunn Edwards, Elastomeric Acrylic Roof Coating, W 5824	65	56	40-60	New low and high density polyurethane foam roofing	Superior adhesion, excellent resistance to water, cracking, and dirt pickup, heat reflective	2 hours to touch, 12 to 18 hours to recoat	N/A
Davlin, Acrylastic 900	64	65	900	Existing and new roofing substrates	UV resistant, tough, flexible, reflective	4 to 8 hours to recoat	N/A
ICI Paints (Sinclair), SAVX70 Roof Coating	62	58	80	For urethane foam roofs, built-up roof, plywood and metal roofs, concrete, and other masonry surfaces	Durable, highly reflective, insulative, UV protection	1 hour to touch, 6 hours to recoat	N/A
Color Wheel, Tropiccoat Roof Paint, Ext. Flat, 340	61	38	400@1.5 dry	Residential, commercial roofs, cement & concrete tiles, glazed tiles, Spanish clay tiles	Waterborne acrylic, mildew resistant, tough, flexible, good color retention, alkali and efflorescence resistant, resistance to blistering, cracking, chipping and peeling	1 hour to touch, 4 hours to recoat	N/A
BLP Mobile Paints, Mobile Home Roof Coating White with Fiber 43-17	59	37	200@3	Commercial and residential use on galvanized metal or aluminum, ideal for mobile homes, metal tool sheds, storage buildings, awnings, canopies	Mildew preventative	1 hour to touch, 2 hours to recoat	N/A
Acry-Tech Coatings, Ceramax	56	57	100@16	Asphalt shingles, metal roofs, smooth asphalt, modified bitumen	Mildew, UV, water resistant, good adherence, strength, elongation	50 min touch 3 hrs recoat	N/A
Gaco Western Inc., GacoFlex A-44, Water-based elastomeric coating	56	51	816@0.025	For urethane foam, built-up roofs, masonry, concrete, plywood roofs	Excellent hardness, adhesion, strength, water resistance	N/A	N/A
Gemini, Total Wood Protectant (TWP) 200	50	94-96	100-250	For wood shingles	Helps wood to stay flexible, penetrates, resistant to mildew, algae and moss, blocks UV rays, water barrier	48 to 96 hours to dry	N/A
Griggs Paint, Elastomeric Coating 300W37	49	53-56	100	Asphalt, aluminum, concrete, polyurethane roofs, wood roofs, galvanized steel	Durable, flexible, weather and flame resistant	4 hours to touch, overnight to recoat	N/A
Anchor Coatings, Thermo-Flex 103 Elastomeric Roof Coating & Sealant	40	42	100	Industrial, commercial, residential, & agricultural substrates such as asphalt, fiberglass, asbestos shingles, concrete or clay tile, precast concrete, slate, sood shake, roll roofing, build-up roof, polyurethane foam, all types of metal	Acrylic resins, rubber-like coating, extremely durable, penetrant, UV resistant, 80-85% reflectant	1 hour to touch, 4 hours to recoat	N/A
Dunn Edwards, Elastomeric Acrylic Roof Coating, W 6139	40	52	55-65@25 wet	Wide variety of roof systems including new and repaint foam roofs, felt composition built-up roofs, asphalt, asphalt shingle roofs, metal roofs, wood, concrete	Excellent resistance to weathering	1 hour to touch, 16 hours to recoat	N/A
Western Colloid, Elastahyde #720 ARC, white	39	53	33	For "fluid applied reinforced roofing" membranes, metal roofs, built-up roofs, singly ply membrane roofs	Elastomeric acrylic coating, high durability, tough, flexible, 87% reflective	1 hour	N/A

Western Colloid, Elastahyde #770 AXP	39	50	33	APP modified bitumen, asphalt emulsion, western colloid "fluid applied reinforced roofing" membranes, build-up, single ply, foam, and metal roof systems	Elastomeric acrylic coating, adheres well, performs well under ponding conditions, tough, flexible, 85% reflective	1 hour	N/A
Western Colloid, Elastahyde #790 AFC	39	59	33	For sprayed polyurethane foam, western colloid "fluid applied reinforced roofing" membranes, western colloid metal roof, conventional and modified built-up roofs, single ply membrane roofs	Elastomeric acrylic coating, high durability, 85% reflective, tough, flexible	1 hour	N/A
Anchor Coatings, Metal-Kote 102, White and Custom Colors	37	32	150-250	All metal roofing, water tanks, storage bins, other building surfaces	Rust and corrosion resistant, UV resistant, 80 - 85% reflectant	1 hour to touch 4 hours to recoat	N/A
American Chemical Technologies, Tri-coat, Elastomeric Coating for EPDM Roof Systems	36	60	25-100	PVC, EPDM, foam, hypalon, built-up roofing, metal	UV, weather resistant membrane, durable; high volume solids composition, lightweight, mildew resistant, solar reflective	24 hours	N/A
Geocel 9500 MB	36	60	40-50	Metal roofs, siding, metallic surfaces	Resists weathering, UV, dirt pick-up, is highly reflective	1.5-2 hrs touch	N/A
KST (Kool Seal), White Elastomeric Roof Coating 63-300	26	N/A	50-100	Metal, concrete, foam, brick, flat cement tile, barrel cement tile, aged aluminum coatings	Forms a rubber-like blanket, 100% acrylic, UV reflective, mildew and algae resistant	N/A	N/A
KST (Kool Seal), Gray Elastomeric Roof Coating 63-320	24	N/A	50-100	Metal, concrete, foam, brick, flat cement tile, barrel cement tile, aged aluminum coatings	Mildew, algae resistant, retains flexibility	N/A	N/A
Gaco Western Inc., Gaco Flex A-32/A-32/R, Water-based elastomeric coating	21	59	951@0.025	For urethane foam insulation, concrete, plywood, metal roofs	Reflective, excellent hardness, strength, water resistance	N/A	N/A
KST (Kool Seal), Black Elastomeric Roof Coat 63-325	21	N/A	50-100	Metal, concrete, foam, brick, flat cement tile, barrel cement tile, aged aluminum coatings	Forms a thick rubber-like blanket, 100% elastomeric acrylic, mildew and algae resistant	N/A	N/A
Gardner-Gibson, Inc. (Sta-Kool), Ultra White Elastomeric Roof Coating 770	20	N/A	50-75	Cement tile; built-up roofs; metal roofs; mobile/RV roofs; bonded gravel roofs; asphalt shingle roofs; roofs previously coated with asphalt, aluminum, or tar	Tough, flexible, durable, resists cracking, resists peeling, resists mildew, reflects UV rays	24 hours to recoat	N/A
Gardner-Gibson, Inc. (Sta-Kool), Ultra White Elastomeric Roof Coating 780	20	N/A	50-75	Cement tile; built-up roofs; metal roofs; polystyrene foam; mobile home roofs; bonded gravel roofs; roofs previously coated with asphalt, aluminum, or tar; built-up roofs, polyester plastic panel, urethane foam, modified bitumen roofs	Thick rubber shield, prevents cracking and roof damage, waterproof, reflects UV rays	24 hours to recoat	N/A
Gardner-Gibson, Inc. (Sta-Kool), White Elastomeric Roof Coating 700	20	N/A	50-75	Cement tile; built-up roofs; metal roofs; mobile/RV roofs; bonded gravel roofs; roofs previously coated with asphalt, aluminum, or tar	Tough, flexible, resists cracking and peeling, reflects UV rays	24 hours to recoat	N/A
American Chemical Technologies, Geotherm, Elastomeric for Hypalon Roof Systems	19	60	25-100	PVC, EPDM, foam, hypalon, built-up roofing	UV, weather resistant membrane, durable; high volume solids composition, lightweight, mildew resistant, solar reflective	24 hours	N/A

KST (Kool Seal), Premium White Elastomeric Roof Coating 63-600	16	100	50-100	Metal, concrete, foam, brick, flat cement tile, barrel cement tile, aged aluminum coatings	UV reflective, high solids, forms a thick rubber-like blanket, mildew and algae resistant	N/A	N/A
Andek, Polaroof AC	10	N/A	33@48 wet	All standard roofing substrates	Acrylic elastomeric, inhibits corrosion, resists fungus, flexible, UV protection, will not crack or get brittle with age	2 to 4 hours to recoat	N/A
American Chemical Technologies, Acta-Cryl Acrylic Roof Coating	9	56	25-100	Built-up roofing, metal roofing	Seamless membrane, durable, solar reflective, UV, mildew resistant	24 hours	N/A
United Coatings, Roof Mate	9	54	N/A	Metal, built-up, concrete, EPDM, Hypalon, modified bitumen, composite shingle roofs	Durable, resists weathering, UV, mildew, is highly reflective, tensile, fire retardant	2.5 hrs	N/A
KST (Snow Roof System), Mobile Coat White Reflective Metal Roof Coating	1	N/A	100	Metal roofs on mobile homes, RVs and trailers	Reflective, rubberized plastic coating, dries rapidly with a built-in primer, expands and contracts, won't crack or peel, mildew resistant	2 to 8 hours to cure	N/A
KST (Snow Roof Systems) Roofer's Best, Professional White Roof Coating	1	N/A	N/A	For professional-grade elastomeric coating for sealing and saving roofs	Rubberized plastic coating, reflective, flexible	2 to 8 hours to touch	N/A
KST (Snow Roof Systems), Premium White Roof Coating	1	N/A	100	Most roof surfaces, mobile homes, old tar, asphalt, metal, concrete	Elastic, rubberized plastic, UV reflective, won't crack or peel	2 to 8 hours to cure	N/A
Andek, Polaroof Firegard	0	N/A	120	All standard roofing substrates	Air-drying, halogenated, aquaborne copolymer, inhibits corrosion, protects against UV deterioration	N/A	N/A
Andek, Polaroof SP	0	N/A	66@20	All standard roofing substrates	Aquaborne, inhibits corrosion, resists fungus, flexible, tough	2 to 4 hours to recoat	N/A
Everest Coatings, Evercoat 5400/5410, Acrylic Elastomeric	0	55	65	For polyurethane foam, metal, and concrete, as well as previously coated surfaces	Excellent weatherability, breathable from underneath, resistant to alkali, UV and mildew, reflective	N/A	N/A
Gaco Western Inc., GacoSil S-50 Water-Based Clear Silicone	0	18	287@0.025	For Decks, metal roofs	Excellent hardness, adhesion, strength	N/A	N/A
GAF Materials, Matrix 715 MB Coating	0	N/A	100	For most roof surfaces including modified bitumen, smooth BUR, Hypalon, PVC, and TPO roofing membranes	Durable, highly reflective, UV resistant	N/A	N/A
Gardner-Gibson, Inc. (APOC), 252 Sunwhite Elastomeric Roof Coating	0	62	50-75	Most roof surfaces	2 coats required, Resists cracking, peeling, mildew, high durability, superior hiding ability, reflective, UV resistant	4 hours to recoat	N/A
Gardner-Gibson, Inc. (APOC), 400 Sunbrite Aluminum Roof Coating	0	N/A	75-100	Virtually any type of roof surface	Reflective, non-toxic, non-combustible	4-8 hours to recoat	N/A
Rust-Oleum (Sierra), S-37 Metalmax DTM	0	40	180-545	DTM application on aluminum, galvanized steel, steel, and other metal surfaces	Direct to metal coating, corrosion and humidity resistant, UV resistant, fast drying	30 min. to touch, 2-4 hours to recoat	N/A
Western Colloid, Product #901 Clear Rock Binder	0	40	50	Gravel roofs, masonry, plaster	High Durability, non sagging	30 min to touch, 1 hour dry	N/A

N/A= Not Available

**Rust Preventative Coatings
400 g/l and less**

Samples 9

Coating Company and Product Name	VOC content (gm/l)	Solids (% by volume)	Coverage	Recommended substrate/exposure	Coating Characteristics	Drying time to recoat	Pot Life @70 deg./ Shelf Life
ICI Paints (Devoe), Catha Coat 305 Water Based Inorganic Zinc Coating	0	61	978	Steel structures, tanks, equipments, piping	Resistance to solvents, good color contrast, resists mudcracking	2 hours	5 hours

Devoe High Performance Coatings Direct-to-Metal Primer & Flat Finish DEVFLEX 4020PF 4020-1000-white	76	44	275-350	Exterior of tanks, metal buildings, structural steel, piping, handrails, masonry construction	Direct-to-metal or masonry primer, shop applications, low VOC, low odor, resists flash rust, corrosion resistance	2 hours	N/A
Devoe High Performance Coatings Direct-to-Metal Primer & Flat Finish DEVFLEX 4020PF 4020-7100-red	80	44	275-350	Exterior of tanks, metal buildings, structural steel, piping, handrails, masonry construction	Direct-to-metal or masonry primer, shop applications, low VOC, low odor, resists flash rust, corrosion resistance	2 hours	N/A
Devoe High Performance Coatings Waterborne Epoxy Primer DEVVRAN 203	107	45	719	Interior or exterior steel, aluminum and certain galvanized metal surfaces, concrete, masonry, glazed brick, ceramic tile	Excellent adhesion, corrosion resistance, good finish coat hiding, low odor, low VOC, easy application	4 hours	N/A
Devoe High Performance Coatings Gloss DTM Waterborne Acrylic Enamel DEVFLEX 659	124	39	156-313	Interior or exterior steel, weathered galvanized steel in institutional, residential and light industrial areas	Direct to metal, low VOC, low odor, fast dry & recoat, resist flash rust, corrosion resistant, high hiding, non-yellowing	4 hours	N/A
ICI Paints (Devoe), High Performance Coatings Catha Coat 302V Zinc Primer	246	78	1250	Steel structures, tanks, equipments, piping	Exceptional resistance to corrosion, mud cracking, fast dry	15 hours	2 years
Insl-X Superior Coating Systems Rust Arrestor RA-0104	90	26	208	Rusted areas where sandblasting is not acceptable, repair and maintenance of existing systems	Chemically converts tightly adhered rust to a black iron complex thus stopping the corrosion mechanism	2 hours	N/A
Insl-X Superior Coating Systems 70% Epoxy Mastic EXS-111	239	73	291	2-component system that can be applied directly to rust or to previously painted surfaces	Bridges, paper & pulp mills, revetments, offshore rigs, sewage treatment plants, encapsulates	4 hours	N/A
Zero Rust Phenolic Alkyd Primer	400	N/A	230-290	Auto restorations, barges & ships, refineries & pipelines, water treatment plants, metal buildings, piping	Direct to metal rust protection barrier	20-30 minutes	N/A

N/A= Not Available

Stains
250 g/l or less Samples 56

Coating Company, Product Name, Components	Interior Exterior	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal)	Recommended substrate/ exposure	Coating Characteristics	Drying Time
Opaque							
Benjamin Moore, 100% Acrylic Latex Solid Siding Stain 067	I/E	250	31	200-400	Siding, shakes, shingles, trim, railing, fences, interior paneling, beams, rafters	Fast drying, excellent color retention, mildew resistant	2-3 hrs touch 3-4 hrs recoat
Superdeck, Solid Color Deck Stain-DB-9000	E	200	N/A	150-350	Decks, fences, siding, trim, shakes	Long lasting, durable, mildew resistant	1 hr touch 2-4 hrs recoat
BEHR , Deck Plus Solid Color Deck, Fence & Siding Stain	E	158-184	N/A	450-500	Wood Decks, Patio Furniture, Fences	Excellent adhesion, resists peeling, scuffing, cracking	2-3 hrs touch
Benjamin Moore, 100% Acrylic Latex Solid Deck Stain 065	E	93-176	39	300-400	Wood decks including pressure treated wood, cedar, redwood	Mildew, blister resistant, durable, excellent color retention	1 hr touch 3-4 hrs recoat
ICI Paints (ICI Dulux), Woodpride Waterborne Solid Color Stain 2600	E	139	28	350-450	Siding, clapboard, shakes, shingles, beams, fences	UV Protection, water repellent, mildew resistant	1 hr touch 4 hrs recoat
Sherwin Williams, WoodScapes House Stain Acrylic A15	E	137	35	200-400	Exterior Wood Surfaces	Long lasting, mildew resistant	1 hr touch 2 hrs recoat
Rainguard, Color-Lok Masonry Stain	I/E	135	34	125-200	Interior/Exterior Masonry surfaces	Fade and chalking resistant, excellent adhesion	2 hours touch/recoat
Behr, Plus 10 Solid Color House & Fence Stain	E	73-135	N/A	200-400	Vertical wood, patio covers, fences, shingles, shakes, siding, masonry and stucco	Superior color retention, durability, adhesion, penetration; resists cracking, peeling, blistering, chalking, erosion	2-3 hrs touch 6-8 hrs recoat
Griggs Paint, 100% Acrylic Stain 301 Series	I/E	127	40-42	300-400	Wood, metal, concrete, masonry	Durable, early water resistance, resistant to wind driven rain, abrasion resistant, water reducible	1 hour to touch, 3 hours to recoat
Okon, Sealer & Stain System OK-760	I/E	127	N/A	N/A	Concrete, masonry, plaster, stucco	UV Resistant, excellent color stability	N/A
Diamond Vogel Paints, BT Series Rustic Tone Solid Color Acrylic Latex Stain	E	126	38	610	Bare wood surfaces, trim and siding	Durable, excellent fade and blistering resistance	0.5 hr touch 2-4 hrs to recoat
United Coatings, Canyon Tone Stain Pigmented Water Repellent Stain	I/E	126	27	50-150	Brick, stucco, stone	UV and alkali resistant, water repellent	15 min touch 1 hour cure
Color Wheel, Tropiccoat Solid Body Ltx Stain 370	E	125	30	300-500	Lumber, trim, beams, plywood, siding, shingles, shakes, fences, railing	Resistant to blistering, cracking, chipping & peeling, mildew resistant, non-yellowing	1 hr touch 4 hrs to recoat
Kwal-Howells, Rustic wood 100% acrylic solid color 6200	E	114	31	250-300	Wood siding, beams, clapboard, hardboard, shakes	Resistant to chalking, blistering, great adhesion	1 hr touch 4 hrs recoat
PPG AF Olympic Procoat Premium Acrylic Solid Color Latex Stain 53900	E	109	34	150-350	Vertical wood, hardboard, masonry, stucco	Durable, long lasting color, UV, mildew resistant	30 min to touch
Porter Paints, Wood Guardian Acrylic 1919	I/E	108	26	200-400	Wood siding, trim, shakes, shingles, fencing	Non-yellowing, weather resistant	0.5 hrs touch 4 hrs recoat
Cloverdale, Acrylic Wood Stain 066	E	103	36	200-500	Siding, shakes, shingles, fences	Excellent exterior durability	45 min touch 2 hrs recoat
Valspar (McCloskey), Solid Deck and Siding Stain	E	103	36	400	Decks, siding, railings, outdoor furniture, porches	UV, moisture, mildew resistant, resists heavy traffic	24 hrs recoat
Benjamin Moore, 100% Acrylic Latex Solid Siding Stain 089	E	100	30	200-400	Shakes, shingles, trim, railing, fences, interior paneling, beams, rafters	Fast drying, mildew resistant	2 hrs touch 3 hrs recoat
ICI Paints (ICI Dulux), 4700 Acrylic Stainteke	I/E	87-98	36	300-400	Wood, stucco, masonry, primed metal	Mildew, water resistant	0.5-1 hr touch 4 hrs recoat
Cloverdale, 379200 Tower Premium Latex Wood Stain	E	97	30	200-320	Fences, wood, composite siding, masonry, railings	Excellent adhesion, UV, weather, chalk resistant, non-yellowing	1 hr touch 4 hrs recoat
Sherwin Williams, Great Outdoors Latex Solid Color Wood Siding Stain Best	E	97	36	400	Lumber, siding, composition board, shakes, shingles, fences	Chalk, fade, bleed and mildew resistant, fast drying and self priming	1 hr touch 4 hrs recoat
Sherwin Williams, ProMar Exterior Solid Color Acrylic Latex Stain A16	E	97	34	200-400	Wood sawn lumber, plywood, shakes, shingles, masonry, aluminum	Fast application & drying, good penetration	1 hr touch 4 hrs recoat

Smiland (Morwear), Exterior Acrylic Solid Color Rustic Stain 4301	E	97	42	300-400	Wood, masonry, concrete, metal surfaces	Super color retention, durable	0.5-1 hr touch 4 hrs recoat
Vista Paint, 3000 Acribond	E	97	40	300-400	Wood, masonry	Durable matte flat finish, mildew resistant	1 hr touch 4-6 hours recoat
PPG AF Olympic House and Trim Exterior Solid Color Latex Stain 54700	E	82-93	35	150-350	Vertical wood, hardboard, masonry, stucco	Durable, long lasting color, UV, mildew resistant	30 min. to touch 2-4 hrs recoat
Kelly Moore, 1240-Acry-Shield Acrylic Flat Finish Pastel Base	E	94	43	200-500	Wood, concrete, masonry, metal surfaces	Long lasting color, weather resistant	1 hr touch 4 hrs recoat
Hallman Lindsay, Kril Tone 100% Acrylic Solid Color Stain 185	E	85	35	400	Shingles, shakes, siding, fencing, most hardboard	Outstanding color retention, mildew resistant, excellent adhesion, durable	2 hrs touch, overnight to recoat
San Luis Paints 500 Emulsa Stain	E	78	46	450	Siding, shakes, shingles,, hardboard,, masonry and stucco	Durable	1 hr touch
Benjamin Moore, Super Spec Acrylic Exterior Stain 179	E	19-75	29	300-450	Rough wood siding, shakes, shingles, hardboard siding, trim and fencing, masonry, stucco	Fast dry, , excellent hiding and adhesion, alkali, blistering, mildew resistant	2 hrs touch 3 hrs recoat
Columbia, Woodtech Solid Color Latex Stain 09-400	E	71	34	100-320	Wood siding, hardboard, brick, concrete, aluminum	Excellent water resistance, adhesion, color retention, alkali resistant	1 hr touch 2 hrs recoat
Sherwin Williams, Great Outdoors Latex Solid Color Wood Siding Stain Better	I/E	71	27	400	Lumber, siding, composition board, shakes, shingles, fences, metal and masonry	Chalk, fade, bleed resistant, fast drying and self priming	1 hr touch 4 hrs recoat
Dunn Edwards, Acri-Flat 100% Acrylic Ext Wood Stain/Masonry Flat Paint W 704	E	70	40	300-400	Masonry, concrete, tilt-up, block, stucco, plaster, exterior metal	Excellent color retention, good grain crack resistance	4 hours
Okon, Weather Pro OK-710	I/E	67	N/A	50-250	Decks, fencing, shakes, siding	Super color retention, UV resistant, water repellent	2 hrs touch
Columbia, Woodtech Solid Color Pre-Stain 09-870	I/E	62	30-32	320-400	Pre-primed fiber cement board Interior & Exterior bare wood substrates	Excellent water resistance, color retention, good penetration	0.5 hrs touch 1-2 hrs recoat
EPMAR, Rembrandt Polymer Stain	I/E	30	20	150-300	Concrete, plaster, cement	Chemical resistant, excellent adhesion	0.5-1 hr touch 2-3 hrs recoat
Van Technologies Inc., Van Aqua-220	I/E	18	N/A	N/A	Wood surfaces	Fast drying	10-20 min.
EPMAR, Kemiko Stone Tone Concrete Stain	I/E	0	N/A	N/A	Concrete, plaster, cement	UV Resistant	N/A
FUHR, ZVOC Universal Stain 155	I	0	14	N/A	Any wood surface	Fast drying	15 min
FUHR, ZVOC Waterbased Stain 5800	I/E	0	14	N/A	Furniture, molding, millwork, cabinets, doors, decks	Chemical resistant, water resistant, excellent durability	5 min. touch, 20 min. recoat
Silvertown Products, Rhinguard Wood Defense	E	0	N/A	550	Wood, decks, siding	UV Resistant	72 hours
Semitransparent							
Superdeck, Exterior Transparent Stains DB-1900	E	250	N/A	150-350	Decks, siding, shakes, log homes	UV resistant, inhibits mildew growth, water repellent	8 hrs touch
Superdeck, Transparent Concrete Stains-DB-6000	E	250	17	100-200	Stone Surfaces, patios, porches, concrete driveways	Mildew, chemical resistant, long lasting,	1 hr touch 4 hrs recoat
The Armstrong-Clark Co., Armstrong's Weather Shield Clear	E	225	N/A	200-400	Decks, siding, shakes, shingles, fences, log homes	Good penetration, water repellent, UV protection	N/A
The Armstrong-Clark Co., Armstrong's Weather Shield Semi-Transparent Stain	E	225	N/A	200-400	Decks, siding, shakes, shingles, fences, log homes	Good penetration, water repellent, UV protection	N/A
Color Wheel, Tropicoat Transparent Wood Stain 100% Acrylic Satin 170	E	170	18	200-400	Lumber, trim, beams, plywood, siding, shingles, shakes, fences, railing	Good chalk resistance, resistant to blistering, cracking, chipping, peeling	1 hr touch 4 hrs recoat
ICI Paints (ICI Dulux), Woodpride Waterborne Semi-Transparent Stain 2610	E	148	24	200-400	Above ground exterior bare wood, siding, shingles, etc.	UV Protection, water repellent, mildew resistant	1 hour touch
Okon, Deck Stain OK-720	E	101	N/A	N/A	Wood stain/horizontal wood applications, shingles	UV resistant, water repellent	2 hours touch

Columbia, Woodtech Transparent Pre-Stain 09-850	I/E	93	18	320-400	Pre-primed fiber cement board Interior & Exterior bare wood substrates	Excellent color retention, good penetration	0.5 hrs touch 1-2 hrs recoat
Okon, Natural Choice OK-820	E	90	N/A	N/A	Decks, fences, log homes, smooth siding, outdoor furniture pressure treated lumber, shingles	UV Resistant, water repellent	2 hrs touch
EPMAR, Kemiko Transparent Stain	E	30	15	300-400	Concrete, plaster, cement, wood	UV Resistant	1 hr touch 2-3 hrs recoat
Silvertown Products, RhinoGuard Furniture Stain	I	0	N/A	N/A	Furniture, doors, wood beams	Fade Resistant	24 hours
Wiping Stains							
Vista Paint, WN11 Wiping Stain	I	245	19	200-400	Interior decorative wood	Semi-Transparent	1 hr touch 2-3 hrs recoat
Farwest, X-6281 Wonderglo Waterborne Wiping Stain	I	180	16	200	Millwork, cabinets, wood furniture	N/A	1-2 hrs touch 8 hrs recoat
FUHR, Wiping Stain 105	E	15	17	N/A	Any wood surface	Fast drying	30-45 min. recoat

N/A= Not Available

**WP Sealers
200 g/l or less**

Samples 19

Coating Company and Product Name	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal)	Recommended substrate/exposure	Coating Characteristics	Drying time to recoat	Pot Life @70 deg./ Shelf Life
Seal-Krete, Multi-Surface Water Repellent	187	N/A	100-400	For multiple surfaces including concrete sidewalks and patios, vertical surfaces such as brick and stucco, and wood	UV resistant, non yellowing, non-flammable	2-4 hours to touch, 24 hours to walk	
Okon, W-1 Water Repellent Sealer OK-910	134	N/A	75-325	Concrete, plaster, stucco-smooth	Breathable, penetrating, dust proofs and hardens concrete, UV resistant	N/A	
Griggs Paint, Hydro-Acrylic Stain 300-65	117	21	150	Concrete Structures, driveways, garages, carports, walkways	Highly durable, water repellent, UV and oil resistant, penetrant	N/A	
Okon, Waterproofing Sealer OK-930	116	N/A	100-400	Adobe, brick, concrete, clay, plaster, plywood, stucco, & wood shingles	Non-yellowing, UV resistant	N/A	
Davlin, Acrylastic 490 Waterborne Elastomeric Wall Coating	75	60	100	Exterior Concrete, masonry, stucco, most wood & metal substrates	Superior Adhesion, peel resistant, extremely tough, resistant to alkali, salt and fungus	24 hours to recoat	
Davlin, Acrylastic 600, Waterproof Deck Coating I	75	51	100	Decks, patios, balconies, terrace, stairs	Extremely tough, superior flexibility	24 hours to recoat	
EPMAR, Kemiko Clear Acrylic Urethane, I	50	30	300-400	Concrete, plaster, wood, metals	UV, stain and abrasion resistant, non- yellowing	30 minutes to touch, 1 hour to recoat	
Smiland (Morwear), Elastomeric Waterproofing Clr 2571-70	30	N/A	80-200	Concrete, stucco, brick, stone, decks	Excellent elongation, excellent tensile strength, excellent exterior durability, excellent water resistance	1-2 hours touch	
Davlin, Acrylastic 490TC Waterborne Elastomeric Textured Coating	29	55	100	Interior & Exterior Concrete, Masonry, Stucco, most wood & metal substrates	Superior Adhesion, peel resistant, extremely tough, resistant to alkali, salt and fungus	24 hours to recoat	
Rainguard, Acry-Lok Acrylic Based Water Repellent	20	12	70-300	Above-grade masonry, concrete, stucco, brick, stone, clay roofs, wood	Conditioner or curing compound on green masonry and concrete, helps prevent efflorescence, chalking, water repellent	N/A	

Seal-Krete, High Solids Waterproofing Sealer	15	25	80-300	For vertical concrete, cement, masonry, and stucco surfaces. Also, stone, brick, adobe, wood, plaster limestone, drywall, galvanized metal, vinyl siding, roof tiles	Waterproofing, excellent adhesion	2 hours	
Seal-Krete, Waterproofing Sealer	8	10	50-300	For vertical concrete and masonry surfaces. Also stucco, concrete, brick, roof tile, wood, siding, galvanized metal	Non-yellowing, reduces efflorescence on brick homes, strengthens mortar joints, color rejuvenator	2-4 hours to dry, 2 hours to recoat	
GE Sealants & Adhesives, VIP1550 Concentrated Water Repellent	1	47	125-450	Concrete driveways, walkways, brick paver, patio deck steps, and vertical masonry surfaces including natural and synthetic stone, tilt up concrete, brick, clay tile, stucco and block	UV resistant, excellent water repellency, resistant to cracking, blistering	12-14 hours for foot traffic	
EPMAR, Sta-Crete 2102 Polyurethane Membrane, 2	0	100	40-160	Concrete, masonry, composites, carbon steel, and wood	Chemical resistant, excellent strength, 20 minute pot life	5 hours to touch, 24 hours to walk	
Henry, #787 ElastoMulsion Waterproofing & Dampproofing,	0	70	100	Above- and below-grade concrete, masonry structures including block foundations	Seamless rubberized asphalt membrane, weathers uniformly, resilient, excellent adhesion, non-flammable	24-48 hours	
Kryton, Krytolseal W/B Clear Acrylic Sealer K-750, Semi-gloss, Interior/exterior	0	N/A	100-400	Wood, concrete panels, stucco, brick, concrete block, masonry	UV resistant, non yellowing, protects against chemicals, stains, biological growth	N/A	
Monopole, Monochem Aquaseal 2 for Wood 3500	0	11	60-250	Solid siding, trim, fencing, plywood, shakes, shingles, deck lumber, patio furniture, doors, window sashes, hardboard, particleboard	Outstanding repellency, protects all wood surfaces from deterioration due to swelling, shrinking or grain raising	N/A	
Samuel Cabot, Waterproofing With Teflon Surface Protector 1000	0	6	150-250	Wood, brick, concrete, masonry, stone	Unsurpassed water-proofing protection, mildew resistant	3 hours to touch, completely dry in 24 hours	
Seal-Krete, Wood Water Repellent	0	N/A	100-200	Wood Surfaces except redwood and cedar	Clear penetrating repellent, non-yellowing, non-flammable, does not promote mildew growth	2-4 hours	

N/A= Not Available

**WP CM Sealers
350 g/l or less**

Samples 65

Coating Company and Product Name	VOC content (gm/l)	Solids (% by volume)	Coverage (sq ft/gal)	Recommended substrate/ exposure	Coating Characteristics	Drying time to recoat	Pot Life @70 deg./ Shelf Life
Clear							
Rainguard, Micro-Seal Clear Water Repellent	284	100	55-120	Dense masonry, cast concrete, porous surfaces	High performance water repellent, resistant to high alkalinity, not effected by UV light or weathering, 6-8 hour pot life	1 hour to touch full cure 48-72 hours	
Prosoco, HydroSeal 20	256	20	125-250	Parking & Concrete structures	N/A	24 hours	
Hill Brothers, Desert Brand DB Total Sealer	250	N/A	125-175	Tiles, masonry, concrete surfaces	Deep penetrating, spalling, cracking, discoloration and efflorescence resistant	2-3 hrs	

Rainguard, American 700 Clear Masonry Deck Sealer	236	N/A	100	Decks, resurfaced concrete, cementitious surfaces, or other non-resilient substrates	Slip resistant, excellent adhesion, weather resistant, fast drying	2 hours	
Prosooco, Concrete Science WaterPel	211	4	N/A	Concrete, stucco & most masonry surfaces	Long lasting, water repellent, alkali resistant	N/A	
Prosooco, Weather Seal GP, General Purpose Water Repellent	211	4	50-175	Concrete, fired clay, marble, travertine, limestone, granite, sandstone, slate	Long lasting water repellent, UV, alkali resistant, penetrant	1 hr. touch	
L & M, Hydroblock	195	15	50-100	Concrete Block	Non-yellowing, mildew resistant, good water repellent	2 hours	
L & M, Hydropel WB	195	8	100-250	Vertical concrete masonry units	Long lasting, water repellent, non-yellowing	2 hours	
Prosooco, Concrete Science Silox 10	194	7	N/A	Concrete & masonry	Long lasting, water repellent, alkali resistant	1 hr. touch 24 hrs cure	
Okon, Pluggler Water Repellent Sealer OK-950	146	N/A	N/A	Vertical surfaces only, Concrete block, masonry, stucco	UV, water resistant, non-flammable	N/A	
Sierra Corp (TK Products), TK-290 WB Tri-Siloxane	140	20	50-250	Concrete, stucco, parking structures, bridge decks	Excellent penetration, UV, alkali, industrial fumes and water resistant	N/A	
Okon, W-1 Water Repellent Sealer OK-910	134	N/A	N/A	Brick-glazed, concrete, granite, limestone, plaster, stucco	Water, household chemicals resistant, non-flammable	N/A	
Prosooco, Concrete Science Water Pel Natural Stone	129	5	N/A	Stone & masonry surfaces	Long lasting, water repellent	4-6 hrs	
Okon, W-2 Water Repellent Sealer OK-920	119	N/A	N/A	Adobe block, brick, concrete, stucco	Water, household chemicals resistant, non-flammable	N/A	
Sherwin Williams, H & C Concrete & Masonry Waterproofing Sealer	114	10	100-250	Concrete, brick, masonry, cinder block, flagstone, canvas, stucco	Efflorescence, spalling, salt and water resistant,	15 min. touch 2-4 hrs recoat	
Karnak, LL10, LL20	40-80	N/A	125-175	Facades, pre-cast concrete, roadways, stucco, brick, terracotta	Water repellent, good penetration, prevents spalling, chloride ion	7-10 days cure	
Degussa/ChemRex, Thoroglaze	75	N/A	100-300	Concrete, concrete aggregate panels, stucco, vertical surfaces, interior/exterior	Durable, non-yellowing, breathable, semi-gloss finish	N/A	
Farwest, X-5645 Aqueous Concrete Sealer	62	23	117-352	Concrete Floors	Excellent weathering, chemical, alkali, water resistance	1 hr touch	
Sierra Corp (TK Products), TK-1311 WB Silane Concentrate	59	N/A	150	Concrete	Water repellent	N/A	
L & M, AquaPel & AquaPel Plus	50	N/A	150-200	All concrete surfaces, brick pavers, aggregate	Highly resistant to moisture, salt, good penetration, breathable	N/A	
All Pro, All-Seal Waterproofing Sealer	47	14	100-250	Masonry, stucco, roof, brick, stone, adobe, drywall, plaster, etc	Highly penetrating, UV, alkali resistant	1 hr touch 4-6 hrs recoat	
Rainguard, Regular Clear Water Repellent	40	8	45-120	Masonry, concrete, stucco, EFIS, composite	Water repellent, UV, chloride resistant, prevents spalling and cracking	1 hour to touch 1 day to recoat	
Rainguard, Super Clear Water Repellent	40	8	45-150	Masonry, concrete, stucco, EFIS, composite	Water repellent, UV, chloride resistant, prevents spalling and cracking	1 hour to touch 1 day to recoat	
Rainguard, Blok-Lok Clear Water Repellent	37	12	55-120	Masonry, concrete, stucco, EFIS, clay, adobe	Superior water repellency, UV, chloride resistant	1 hour to touch 1 day to recoat	
Smiland (Morwear), Elastomeric Waterproofing, Clear 2571-70	30	N/A	80-200	Concrete, wood & masonry	Excellent elongation, durability, water resistance	1-2 hrs touch	
United Coatings, Canyon Tone Clear Transparent W/B Sealer	29	10	100-250	Concrete, masonry	UV stable, deep penetrating, chloride, spalling, water resistant, non-yellowing	15 minutes 1 hr. cure	
Seal-Krete, High Solids Waterproofing Sealer	15	25	80-300	Vertical surfaces only, Stone, brick, adobe, wood, plaster limestone, coral, drywall	Waterproofing, excellent adhesion, non-yellowing, breathable	1-2 hours	

Seal-Krete, Waterproofing Sealer	8	10	50-300	Stucco, concrete, brick, roof tile, wood, siding, metal, adobe	Non-yellowing , good adhesion and penetration	1-2 hours	
Smiland (Morwear), Int/Ext Heavy Duty Waterproofing 2555-70	2	N/A	50-200	Concrete, masonry, brick, stucco, stones, porous tile sandstone, slate	UV protectant, stops spalling and dusting, good adhesion, highly water repellent	72 hours	
GE Sealants & Adhesives, VIP1550 Concentrated Water Repellent	1	47	125-450	Concrete driveways, walkways, brick paver, patio deck steps, and vertical masonry surfaces including natural and synthetic stone, tilt up concrete, brick, clay tile, stucco and block	UV resistant, excellent water repellency, resistant to cracking, blistering, alkali, spalling, chloride ion	12-14 hours for foot traffic 7 day cure	
Life Paint Company, #1325 Micro-Life Concrete Masonry Sealer	1	6	100-150	Concrete, masonry blocks, stucco	Fast drying, penetrating	Fast drying	
BEHR, No. 980 Concrete & Masonry Waterproofer	0	N/A	250	Block, pavement, stucco, brick, unglazed tile, concrete, slate	Excellent penetration, resists spalling, efflorescence, mildew	24-48 hrs	
Degussa/ChemRex, Thoroclear Special	0	N/A	200-300	Interior/exterior, vertical/horizontal concrete, aged limestone	Penetrates, seals, water repellent, breathable	N/A	
L & M, Seal Hard	0	N/A	200	Concrete floors	Abrasion resistant, non-yellowing, chip and peel resistant, odorless	2-4 hours	
Prosoco, ToughCoat PS	0	18	200-600	Concrete surfaces	Resistant to chemicals, oil, gas, & rubber marking	4-5 days	
Samuel Cabot, Waterproofing With Teflon Surface Protector 1000	0	6	100-250	Wood, masonry, concrete, brick, stone & unglazed tile	Washable, water, oil and grease repellent, mildew resistant	3 hrs touch 24 hours recoat	
Sherwin Williams, H & C WB-50 Water Based Water Repellent	0	3	N/A	Concrete, concrete block, bricks, tiles, plaster	Flexible, durable, inhibits mold and mildew growth	1-4 hrs touch	

Pigmented							
Benjamin Moore, 100% Acrylic Elastomeric Waterproof Coating Flat 056, White	250	39	80-100	For uncoated or new masonry and previously painted surfaces such as smooth stucco, concrete/cinder block, fiber cement siding, pre-cast concrete, poured in place concrete, and tilt-up construction	Resistant to wind driven rain, salt spray (fog), mildew, long lasting	2 hrs touch Overnight recoat	
Benjamin Moore, 100% Acrylic Elastomeric Waterproof Coating Low Lustre 055, White	250	39	60-80	Uncoated or new masonry and previously painted surfaces such as stucco, concrete/cinder block, fiber cement siding, pre-cast concrete, poured in place concrete, and tilt-up construction	Resistant to wind driven rain, salt spray (fog), mildew, long lasting	2 hrs touch Overnight recoat	
Benjamin Moore, Moorlastic, Elastomeric-Fine Texture 060, White	250	49	40-80	New and previously painted stucco, concrete block, cast-in-place, precast, tilt-up concrete, exterior insulation finishing systems (EIFS), brick, wood, and metal	Capable of 330% elongation, mildew resistant, wind driven rain resistant, allows water vapor transmission	2 hrs touch 4-6 hours	
Benjamin Moore, Masonry Sealer 066, White	200	13	200-400	Concrete, masonry, stucco, block construction	Excellent adhesion, alkali resistant	1 hr touch 4 hrs recoat	
Hill Brothers, Concrete/Masonry Floor Paint & Sealer-Pigmented	200	6	400-450	Concrete, masonry, floors, porches, patios	Excellent adhesion, deep penetrant, scuff resistant, non-yellowing	24 hrs	
Sherwin Williams, H & C Block Shield Masonry Waterproofer, White and various colors	173	42	75-150	Interior & exterior concrete, masonry stucco, bricks	UV resistant, above and below grade application	1 hr touch 3 hrs recoat	
Columbia, Master Grip Modified Acrylic Primer 05-054, Off-white	156	41	215	Interior, exterior masonry, concrete, brick & concrete block	Excellent adhesion, alkali resistant, high coverage	1-2 hrs touch 16 hrs recoat	
Rainguard, American 500 Colored Masonry Deck Sealer	109	N/A	120	Masonry, balconies, decks, patios, driveways, walkways	Slip resistant, excellent adhesion, weather resistant, fast drying	1-2 hours	
Poly-Carb, Mark 87.6 Smooth Elastomeric Wall Coating	100	N/A	N/A	Block, concrete, stucco and cement	Flexible, breathable, UV resistant	N/A	
Sherwin Williams, ConFlex XL Texture High Build A5-800 Series, Most Colors	94	49	70-80	Concrete, stucco, masonry	Extremely strong adhesion, mildew resistant, flexible, durable	4 hrs touch 24 hrs recoat	
Sani-Tred, AR-SF Colorcoat (Gray, Tan or White)	78	90	N/A	Concrete decks, metal, wood, masonry	Water repellent, excellent adhesion, UV, chemical, blister, cracking, peeling resistant	N/A	
Everest Coatings, Evercoat 700S High Modulus Waterproof Coating, 1	69	60	50-100	Concrete, masonry, stucco	Durable, UV, mildew resistant, good adhesion	3 hrs touch 12-24 hrs recoat	
Degussa/ChemRex, Thorocoat DOT	58	49	60-100	Vertical and overhead concrete surfaces, DOT concrete structures, previously coated surfaces	Resists wind driven rain, weathering, erosion and impact, water vapor permeable, recoatable	1-2 hrs touch 2-4 recoat	
Degussa/ChemRex, Thorocoat F-74	56	49-51	N/A	Pedestrian traffic concrete decks, floors, walkways, stairs, swimming pool decks	Skid, UV, weather resistant	24 hrs cure	
Vista Paint, 500 Solutex Concrete Masonry Sealers 4600 Uniprime II, White and Tintable	58	51	35-60	Concrete, stucco, plaster, masonry	Excellent elongation, superior adhesion, durability	4 hrs touch 8 hrs recoat	

Degussa/ChemRex, Thorolastic	38-50	58	50-100	Exterior above grade concrete structures, brick and concrete masonry	Flexible, breathable, UV, wind driven rain, CO ₂ resistant	6 hrs touch 12-24 recoat	
Degussa/ChemRex, Thorogard	44	47	80	Exterior, above grade walls, previously coated surfaces, aged stucco, concrete, plaster	Flexible, breathable, UV, weather resistant	5 hrs touch 12-24 hrs recoat	
EVR-Gard Coatings, 119 Elastomeric Wall Coating, White and custom colors	25	45	50-100	Wood, masonry, concrete, metal	Tough, flexible, water repellent	1 hr touch 24 hrs recoat	
Degussa/ChemRex, Thoroseal	0	N/A	225-450 per 50 lbs	Concrete, block, brick, porous stone, basements and retaining walls, bridges, foundations, above and below grade	Breathable, waterproof, covers defects and blemishes	7-10 day cure	
EPMAR, Tru-Kote 1120 High Solids Epoxy, 2 component, Various Colors	0	95	250-300	Concrete, masonry, fiberglass	Excellent adhesion, chemical resistance, 30 minute pot life	6-8 hrs recoat	
Poly-Carb, Mark 154 (2 component)	0	N/A	N/A	Highway bridge decks	Flexible, de-slicking	N/A	
Poly-Carb, Mark-163 Flexogrid (2 component)	0	N/A	N/A	Highway bridge decks	Flexibe, de-slicking, non-porous, fast-curing	N/A	
Gaco Western Inc., GacoFlex LM-60 Urethane Black, 2	0	100	25	Concrete, metal & plywood	Excellent resistance to water immersion, good alkali and salt resistance, durable, 1 hour pot life	N/A	
Both Clear and Pigmented							
Benjamin Moore, Moore's Alkyd Masonry Sealer C077, White/Clear	350	55	100-300	Exterior Use on masonry surfaces	N/A	N/A	
JFB Hart Coatings, Inc HP-146 Clear/Pigmented	100	33	240-480	Steel, aluminum, galvanized metal, concrete/block, masonry, wood	Superior color, gloss retention, non-yellowing, good chemical and abrasion resistance	8 minutes to touch, 30 minutes to recoat	
Okon, Waterstopper OK-970, Tintable	90	70	N/A	Basement walls, block walls, brick, foundations walls, retaining walls, stucco	Low abrasiveness, non-flammable, UV resistant, breathable	0.5 hrs touch 3 hours recoat	
JFB Hart Coatings, Inc HP-105 Clear/Pigmented E/I, 2	0	53	350-450	Steel, aluminum, galvanized metal, concrete/block, masonry	Non-yellowing, UV and chemicals resistant, flexible, mar and abrasion resistant	6-8 hrs recoat	

N/A= Not Available

APPENDIX C

AVES STUDY

**DEVELOPMENT AND DEMONSTRATION OF
ZERO- AND LOW-VOC RESIN TECHNOLOGY
FOR ADVANCED CONTROL MEASURE DEVELOPMENT**

FINAL REPORT

Prepared for:

**South Coast Air Quality Management District
21865 East Copley Drive
Diamond Bar, CA 91765**

AQMD Contract #99143

Prepared by:

**AVES, an Affiliate of ATC Associates Inc.
50 E. Foothill Boulevard
Arcadia, CA 91006
(626) 447-5216**

March 29, 2001

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DISCLAIMER

This study was conducted as a result of work sponsored, paid for, in whole or in part, by the South Coast Air Quality Management District (AQMD) under contract #99143. This report has been prepared for the exclusive use of the AQMD, any other use of this report or any portion of the contents of this report by other parties is inappropriate and unauthorized. The opinions, findings, conclusions, and recommendations are those of the author and do not necessarily represent the views of the AQMD, AVES and Adhesives Coating Company (ADCO). The conclusions presented in this report are the professional opinions based solely upon author's interpretation of the available testing data. This work was performed within the guidelines of the proposed submittal, and subsequently accepted by AQMD, with customary thoroughness and competence at the time and place the services were rendered. The AQMD, its officers, employees, contractors, and subcontractors make no warranty, expressed or implied, and assume no legal liability for the information in this report, nor has AQMD passed upon the accuracy or adequacy of the information contained herein.

EXECUTIVE SUMMARY

The AQMD awarded a contract to AVES, an affiliate of ATC Associates Inc., to develop architectural coatings with a zero- or near-zero content of volatile organic compounds (VOCs). The coatings developed under this contract include exterior opaque stains, exterior and interior semitransparent stains, waterproofing sealers (clear), clear wood finishes, (lacquers), varnishes and sanding sealers. Along with the development of the coatings, the contract also required comparative side-by-side testing for performance and repairability of the new coatings, and coatings currently in commercial use by the industry and a field demonstration. Additionally, cost-effectiveness and environmental impacts of new coatings were also evaluated and compared with commercial coatings used today.

Architectural and Industrial Maintenance (AIM) coatings are one of the largest non-mobile sources of VOC emissions in the South Coast Basin. Their emissions exceed those of petroleum refining, degreasing and dry cleaning combined, and the combined VOC emissions from the 950 largest VOC-emitting facilities. It has been estimated that 25 percent of all hydrocarbons used as solvent are used in paints and coatings. Stains, waterproofing sealers and clear wood finishes used as architectural coatings contribute over 5 tons of VOC emissions per day into the South Coast Basin. These VOC emissions contribute to the formation of smog in the atmosphere. VOCs react photochemically with oxides of nitrogen to form ozone. Ozone causes shortness of breath, kills lung cells and is suspected of causing premature aging of the lungs. Ozone also damages plant life and certain materials. The VOCs also contribute to the formation of PM₁₀ (particulate matter less than 10 microns in size). PM₁₀ is another pollutant that adversely affects human health and limits visibility. Because these small particulate matters penetrate into the deepest regions of the lung, they affect pulmonary function and have been linked to increased deaths.

The AQMD issued a Request for Proposal (RFP) for the development and demonstration of zero- or low VOC architectural coatings cited above. The RFP required co-funding, and specified the completion of three tasks: 1. Identify and develop promising resin technologies that can be used in a zero- or low-VOC coating system; 2. Test the coating on a variety of substrates using industry standard test methods, and; 3. The preparation of a final report detailing all aspects of the project.

AVES and Adhesive Coatings Company (ADCO) formed a team to pursue the RFP, using ADCO's developed and patented zero-VOC, water-based resin technology called RESLIX[®] that was used to develop and demonstrate a zero-VOC metal coating system through the Innovative Clean Air Technology (ICAT) program of the California Air Resources Board (ARB). Based on the results of the competitive solicitation, AVES and ADCO were selected to develop and demonstrate zero, or low-VOC stains, waterproofing sealers, and clear wood finishes.

This Executive Summary includes some generalized conclusions from side-by-side comparison testing and field demonstration. They are:

1. Most performance characteristics of this new no-VOC wood coating system (including adhesion, beading, chemical resistance, coating penetration, dirt pick-up, dry time, mar resistance, moisture vapor transmission, stain blocking, print resistance, swelling, water uptake, and overall appearance) are equivalent to those of commercial coatings based on the side-by-side comparative testing results. Advantages of these no-VOC coatings include better grain raising for varnish, less color change (for lacquer, varnish, and sanding sealer), better moisture/UV resistance for exterior semitransparent stain, and better water repellent efficiency for waterproofing sealer. However, the dry time, freeze/thaw properties, pot life, mildew/fungus resistance, printing resistance, and stain blocking properties of these no-VOC waterborne coatings are not as good as those of solvent-based coatings.
2. Three popular commercially available water borne and solvent-based coating systems (both lacquer and varnish) were tested side-by-side with no-VOC lacquer and varnish topcoat systems for repair and refinishing. This new no-VOC varnish system showed the best overall appearance after repair, but had the highest coating usage because the two-component coating resulted in a limited pot life. The new no-VOC Lacquer system was the easiest to repair and showed the best gloss difference after repair.
3. In order to obtain the impartial opinion of experienced painters on the performance of the new coatings, the painters of Commercial Casework, Inc. in Fremont, California conducted a field demonstration of the new coating system as part of this study. The personnel from Commercial Casework were impressed with the new wood coatings due to faster dry times, ease of use, good appearance qualities, and the safer working environment resulting from the absence of solvents.
4. This new coating system unit price (cost per gallon) is lower than the unit price of the hybrid system, but higher than those of the solvent-based coating systems on the market. However, once all other long-term cost savings are factored in (no emission fees, water clean-up, and no disposal fees), this new coating system price is more attractive. In addition, use in stationary sources can eliminate the VOC emissions ceiling, allowing the increase of productivity due to unlimited no-VOC coating usage. Cumulative environmental impacts on this no-VOC coating system are insignificant, and no significant project-specific cost impacts are anticipated.
5. By using this new no-VOC water-based coating technology, the anticipated air emissions reduction and health risk reduction could be achieved. Therefore, commercialization of the proposed technology will provide an alternative for compliance with current and future emission standards for coating operations imposed by federal, state, and local government agencies.

SECTION 1.0 - INTRODUCTION

1.1 Scope

The scope of this project was to develop several architectural coatings that are commercially used in relatively large volumes, with zero, or low VOC content and demonstrate their technical, environmental and economic feasibility to further reduce VOC emissions in the basin. The coatings developed under this project are: opaque stains, exterior and interior semi-transparent stains, waterproofing sealers (clear), clear wood finishes (lacquers), varnishes, and sanding sealers.

1.2 Background

The 1999 Air Quality Management Plan (AQMP) addresses emission reductions from architectural coatings in a control measure entitled "Further Emission Reductions from Architectural Coatings and clean-up solvents (Rule 1113)" CM#99CTS-07 (P3). CM#99CTS-07 (P3) requires additional reduction in VOC emissions. Over the past four years, Rule 1113 was amended twice to achieve a 55% emission reduction in two phases. In phase I, Rule 1113 was amended on November 2, 1996 to achieve approximately 17.5% (10.3 tons/day (t/d)) emission reductions. In phase II, an additional 38% (21.8 t/d) emission reduction was achieved with the amendment of May 14, 1999.

The final 20% (10 t/d) emission reduction, as required by CM#99CTS-07 (P3), necessitates the development and commercialization of zero- and low-VOC architectural coatings in certain large-volume categories. The AQMD Staff identified stains, waterproofing sealers, and clear wood finishes as large-volume coatings that contribute over 5 t/d of VOC emissions to the atmosphere. This project is designed to develop and demonstrate zero- and low-VOC technology that can be utilized by AQMD staff in their technology assessment for further rulemaking in these categories.

AVES has teamed with ADCO, a firm specializing in the development of zero-VOC water-based coatings. ADCO developed and patented a zero-VOC, water-based resin technology called RESILEX[®], which was used to develop and demonstrate a zero-VOC metal coating system through the Innovative Clean Air Technology (ICAT) program of the California Air Resources Board (ARB).

1.3 Potential Air Quality Benefits

The modified RESILEX[®] resin was the backbone resin used in the development of several coatings under this project.

Most of the emission reduction was from a requirement that flat house paints contain 60% fewer VOCs by July 2001, and no more than 50 grams per liter of VOCs by July 2008. The latter will effectively require that flat paints be nearly solvent free by 2008. The rule also required reductions in the VOC content of lacquers (which was also a part of this study), traffic paints, and specialty multi-color coatings.

The commercial use of zero-VOC coatings developed under this project will result in further VOC emission reductions in the Basin. According to the 1999 ARB survey of 1996 coatings, the VOC emissions from these coatings are over 5 tons per day in the South Coast Basin (see Table 1-1). If new coating systems (less than 50 g/l) are successfully implemented, over 2.56 tons per day of further VOC emissions reduction from these new coating categories beyond potential reduction with future rule limit would be achieved.

Table 1-1 ARB Coating Survey

Coating Category	VOC Emissions (tons/day)	Potential Reduction with Future Limit (tons/day)	Further Reduction with No-VOC Coatings (tons/day)
Clear Wood Finishes – Lacquers	1.53	1.11	0.37
Semitransparent Stains	1.17	0.38	0.67
Clear Wood Finishes – Varnishes	1.11		1.03
Waterproofing Sealers	0.76	0.52	0.21
Clear Wood Finishes - Sanding	0.21	0.01	0.19
Opaque Stains	0.23	0.12	0.09
Total	5.01	2.14	2.56

VOC emissions reduction calculation details are attached in Appendix F.

SECTION 2.0 - TECHNOLOGY DEVELOPMENT

2.1 Identification and Development of Promising Resin Technologies for Low- or Zero-VOC Coating Systems

2.1.1 Desired Resin Characteristics

During the 1990s, numerous manufacturers have developed and marketed acrylic-based, waterborne coatings that exhibit performance characteristics equivalent to or superior to the traditional solvent-based coatings. The first generation of waterborne coatings had stability, rheology, water-immersion, loss of gloss, lack of corrosion resistance, loss of drying capacity, and bacterial degradation problems. However, subsequent formulations, using a new generation of performance enhancing additives, as well as innovative resin technologies, have minimized the problems to a practical level, or completely eliminated them. Technology breakthroughs include the following:

- Flow and leveling agents that mitigate the flow problems, even on substrates like plastic, glass, concrete, and resinous wood. These additives even assist in overcoming flow and leveling problems when coating oily or contaminated substrates.
- Pigment-wetting agents have assisted in better dispersion of organic pigments in an aqueous media by altering their hydrophobic nature. This results in better rheology characteristics.
- Defoamers and microfoam agents have mitigated the bubble retention problems, thereby eliminating the loss of drying capacity, and thus improving the film.
- Biocides that are not susceptible to degradation by hydrolysis have provided good stability and eliminated the settling problems.

With the development of these additives, some waterborne coatings now perform better than solvent-based coatings. The biggest problem with waterborne coatings is the dry time. Water, with its slow evaporation rate and high latent heat of evaporation, does not have the latitude that solvents do with their wide range of evaporation rates and boiling points. On a warm, dry day, waterborne coatings dry faster than the high-solids, solvent-based coatings, but the dry times can be significantly extended on cold, humid days, which causes problems in some areas. However, with the development of non-volatile, reactive diluents combined with hypersurfactants, performance of these nearly zero-VOC coatings has equaled, and in some characteristics, outperformed traditional, solvent containing coatings.

The durability of a coating is governed by the nature of the binder (also known as film formers or resins) used in its formulation. Typical coated substrates are exposed to a

variety of influences of daily life, including mechanical stresses, chemicals and weathering, against which they serve to protect the substrate. The major impact on the exterior coating film is oxidation by exposure to light, causing the film to first lose color and gloss, and gradually become brittle and incoherent. This is mainly caused by a process known as photochemical degradation. This is especially the case for coatings used for exterior painting.

The coatings industry has developed a variety of additives that act as ultraviolet light (UV) absorbers or free-radical scavengers that ultimately slow down the photo-oxidative process, thereby increasing the coating life. Antioxidants and sterically hindered amines are two classes of free-radical scavengers, also known as hindered amine light stabilizers (HALS). These can be used with solvent-free or waterborne coatings. Other additives that have positive effect on durability of coatings include adhesion promoters, corrosion inhibitors, curing agents, reactive diluents, optical brighteners, and algaecides/mildewcides.

At the start of this project, AVES, ADCO and AQMD staff listed the desired following performance properties of this resin technology to formulate coatings:

1. No VOCs/no Hazardous Air Pollutants (HAPs)
2. Rapid dry (initial) characteristics upon application
3. Hardness
4. Flexibility
5. Chemical resistance
6. Durability
7. Minimized deterioration
8. Coverage

2.1.2 Identification of New Zero-VOC Resin Technology

In the past, products have typically been developed and marketed that attempt to increase emulsion molecular weight in order to enhance film properties but also required solvents to help the polymer to coalesce. The addition of solvents results in coatings that are odoriferous and potentially hazardous. ADCO's patented innovation-RESILEX[®], a resin emulsion in water alters the distribution of the molecular weights of a resin and results in an innovative technology and product which has four unique properties: (1) a unique distribution of molecular weights; (2) the presence of a unique high molecular weight polymer which is insoluble in many strong organic solvents yet is soluble in this resin emulsion; (3) the ability to coalesce at temperatures below their normal glass transition temperature when added to other waterborne polymers; and (4) a superior binder system for the formation of a high performance coating.

RESILEX[®] was engineered as the next step beyond conventional water-based emulsion systems. Based on earlier test results of this resin system, ADCO's technology

provides a solvent-free, water-borne polymer that exhibits, in a final paint film, better film properties (hardness, flexibility, chemical resistance, and overall durability) than even some of the newest emulsions on the market. Unlike most zero-VOC coatings, ADCO's polymer had better ultraviolet radiation resistance and flexibility while maintaining superior hardness. RESILEX[®] is colorless, odorless, and VOC- and hazardous air pollutant (HAP)-free. RESILEX[®] can be used (1) as a resin system alone, (2) in combination with other water-based resin systems, or (3) as an enhancement in latex paint formulations to provide greater durability.

In addition, the Team used a non-yellowing urethane acrylic resin that provides excellent falling sand and high impact resistance to coating and adhesive formulations. The resin was used as a base resin or combined with various monomers. This resin system offers exceptional flexibility, clarity, and excellent heat and light stability to UV/EB cured products.

2.1.3 Formulating Candidate Coatings

The goal of the project was to develop and demonstrate zero-VOC or low-VOC coatings (varnish, lacquer, interior and exterior stains, waterproofing sealers and sanding sealers) to further reduce VOC emissions in the Basin.

The task to develop these coatings was focused on making the necessary formulation adjustments to ADCO's patented polymer emulsion. This emulsion was used as the basis for formulating the required stains, sealers, and clear wood finishes while producing products with VOCs less than 10 g/l (calculated from GC/MS analysis results).

The target in developing the coatings was to achieve a performance level equal to, or better than that of similar coatings widely used by the industry. The performance characteristics in the new coatings were focused on the following areas: hardness, hot/cold check, adhesion, printing/blocking, household chemical resistance, drying time, moisture resistance, UV resistance, freeze/thaw, orange peel, leveling, sagging, film thickness, mildew/fungus resistance, dirt pick-up, substrate penetration, stain blocking, water repellent efficiency, beading, swelling, moisture vapor transmission, scrape/mar resistance, color change, sprayability, clarity, depth, gloss, graininess, etc.

The characteristics of the raw materials are of great importance to the creation of a water borne resin system that dries quickly and exhibits good initial film properties without coalescing solvents. Particle size, minimum film forming temperature, glass transition temperature, resin polarity, and dynamic surface tension are among the most important factors to consider in the formulation.

2.1.3.1 Lacquers

Lacquers are clear wood finishes (including lacquer sanding sealers) formulated with nitrocellulose or synthetic resins that dry by evaporation with no chemical reaction characteristics.

The new zero-VOC lacquer is a water reducible, air-dry polyurethane and acrylic copolymer. This approach includes blending of pre-existing commercial and proprietary polymers and creating hybrid polymers (graft) prior to dispersion in water.

2.1.3.2 Varnishes

Varnishes are clear, wood finishes formulated with various resins to dry by chemical reaction upon exposure to air.

The new zero-VOC clear wood topcoat is a two-part, chemically cured, water reducible, air-dry epoxy coating. It can be used as a sealant and as a high gloss, durable topcoat giving a clear finish. The absence of organic solvents in the formulation or their formation during curing results in zero emission of VOCs and HAPs.

The two part varnish consists of RESILEX[®] (Part A), and curing agents (Part B). Tests of polymer variations of RESILEX[®] (Part A), in combination with each of several proprietary curing agents (Part B) were conducted. Various mixing ratios were evaluated for each Part A/Part B combination, and the best ratio was selected for further evaluation. This evaluation consisted of applying these coatings onto panels, and testing for dry time, adhesion, appearance, and chemical resistance.

2.1.3.3 Waterproofing Sealers

Waterproofing sealers are colorless coatings that are formulated specifically for (1) prevention of water penetration of porous substrates, and (2) preservation of surface appearance or texture.

The new no-VOC waterproofing sealer is a water reducible, air-dry special hydrophobic acrylic copolymer. The new waterproofing sealer is a clear, water borne protective coating for use on many types of surfaces, including wood and concrete. It seals, water proofs, and dust proofs the surface. Waterproofing sealers help prevent water damage by reducing water absorption in various porous materials.

2.1.3.4 Sanding Sealers

Sanding sealers are clear wood coatings formulated for and applied to bare wood in preparation for sanding and to seal the wood for subsequent application of coatings.

The no-VOC sanding sealer is a water reducible, air-dry acrylic copolymer. The polymer has a unique mix of molecules with different molecular weights. Because of its

unique structure, it allowed the replacement of all of the coalescent in the sanding-sealer with no-VOC resin solids. The sanding sealer is compatible with the no-VOC topcoat and stains. This formulation has good sandability, minimum wood yellowing, and good intercoat adhesion.

2.1.3.5 Stains

Stains are opaque or semi-transparent coatings that are formulated to change the color but not conceal the grain pattern or texture of wood or other porous materials.

The zero-VOC stains are ultra-fine acrylic resin dispersions with surfactants, fungicides (exterior stain only), U. V. absorbers (exterior stain only), and zero-VOC pigment dispersions. The resin provides a solution-like appearance and penetration properties along with reduced grain rising. The new zero-VOC stains have the following features:

- Small Particle Size Emulsion - The ultra fine particle size allows for deep penetration into wood substrates with minimum grain raising.
- Excellent Film Formation Characteristics - Require no coalescing solvent.
- Good Color Development and Clarity - Stains show good color strength due to the inherent clarity of the polymer used.
- Easy to apply with good workability.
- Low odor.

The stains combine the best features of linseed oil and acrylic latex for superior color retention, adhesion, penetration and durability. The no-VOC resin system used in stain does not form a traditional type of film, but instead permits the wood to breathe and release moisture which eliminates cracking, peeling and blistering, while providing resistance to weathering, chalking, and erosion.

SECTION 3.0 - TESTS AND RESULTS

The newly developed coatings were tested for their performance and VOC content. The tests are divided in the following categories:

- VOC Determination
- Comparative Performance Properties
- Comparative Repair/Refinishing
- Field Demonstration

3.1 VOC Determination

This task was focused on confirming VOC contents of new coatings formulated for this project. The following new no-VOC coatings were tested:

1. Wood Lacquer
2. Wood varnish (Part A and Part B)
3. Wood sanding sealer
4. Exterior opaque stains
5. Exterior semi-transparent stains
6. Interior semi-transparent stains
7. Waterproofing sealer

All coatings were prepared in ADCO's laboratory and analyzed in an independent testing laboratory (APC Laboratory, Chino, California). The ASTM methods that were followed to verify VOC/HAP content are summarized in Table 3-1.

Table 3-1 Methods Used for VOC and HAP Air Emission Testing

Measurement	Method
VOC	AQMD Method 304
Volatile content	ASTM-D-2369
Density	ASTM-D-1475
Water content	ASTM-D-3792 (GC)
HAP	EPA Method 8240 (GC/MS)

Table 3-2 VOC Measurements for New Coatings by GC/MS

Coating Category	VOC Content (g/l)
Clear Wood Finishes – Lacquers	<10
Clear Wood Finishes – Varnishes	<10
Sanding Sealers	<10
Waterproofing Sealers	<10
Exterior Semitransparent Stains	<10
Interior Semitransparent Stains	<10
Opaque Stains	<10

Analysis by GC/MS confirmed that VOC contents were less than 10 g/l (VOC contents less than 50 g/l cannot be calculated accurately by the EPA Method 24 or AQMD Method 304).

3.2 Comparative Performance Properties

Extensive testing was performed to compare a wide range of performance properties of each of the newly developed coatings with the performance properties of the last three functionally similar coatings commercially used by the industry. The purpose of these tests was to determine how well each of the new coatings performs compared to similar coatings that are widely accepted and used by the industry. In addition to comparing the individual coatings, the performance properties of the new and currently used coating systems, comprising of semi-transparent stains, sanding sealers and topcoats (lacquers and varnish), were also compared.

All comparative testing, except five specialized tests, were conducted at the warehouse of ADCO's laboratory. The laboratory is located within the warehouse, which is greatly impacted by external temperatures and humidity conditions, as well as soil dust from operations directly across the street. The environmental conditions are estimated as follows:

Conditions: Temperature: 45°-75°F
 Relative Humidity: 40%-65%

Five specialized tests, which included mildew/fungus resistance, dirt pick-up, stain blocking, water repellence, and moisture vapor transmission were subcontracted to Calcoast Laboratory located in Emeryville, California. Calcoast laboratory specializes in conducting a variety of tests on coatings and is equipped to run ASTM, FM and other specialized tests (see attached brochure in Appendix G).

The following individual coatings were selected for comparative testing:

1. New wood Lacquer and 3 commercial clear wood coatings including a nitrocellulose lacquer
2. New wood varnish and 3 commercial varnishes
3. New wood sanding sealer and 3 commercial sanding sealers
4. New exterior opaque stains and 3 commercial opaque stains
5. New exterior semi-transparent stains and 3 commercial semi-transparent stains
6. New interior semi-transparent stains and 3 commercial semi-transparent stains
7. New waterproofing sealer and 3 commercial waterproofing sealers for concrete and wood

Three coating systems were used in this testing are as follows:

1. System 1: Semi-transparent stain/sanding sealer/varnish
2. System 2: Semi-transparent stain/sanding sealer/lacquer (two coats)
3. System 3: Semi-transparent stain/sanding sealer/lacquer (three coats)

The comparative performance tests conducted on each coating and coating system are listed below. The test method used for comparative performance tests are included in Appendix A (Test Protocol for Comparative Performance Tests). The results of the comparative tests are included in Appendix B (Results of Comparative Performance Tests).

3.2.1 Lacquer

Application Method

Surface Preparation: Bare wood surfaces were sanded to a smooth uniform surface with 120-grit sandpaper. All dust was removed. For stained surfaces, the stain was allowed to dry overnight. The sanding sealers were then applied, sanded lightly with 220-grit sandpaper and the dust was removed.

Application: The lacquer was stirred thoroughly, and not shaken. Lacquer was applied by conventional air gun (number 66 tip). The lacquer was applied approximately three mils thick per wet coat. Three coats were applied over bare wood. For system application, two coats over a sealer and a stain were applied for appearance and durability.

Test Results

Comparative Tests Performed	New Coating Performance
Wet Film Thickness:	Equivalent
Freeze/Thaw:	Inferior
Dry Time: Set to touch	Equivalent to waterborne, slower than nitrocellulose

Tack free	Equivalent to waterborne, slower than nitrocellulose
Dry through	Equivalent to waterborne, slower than nitrocellulose
Dry hard	Equivalent to waterborne, slower than nitrocellulose
Gloss:	Equivalent
Grain Raising:	Equivalent
Orange Peel:	Equivalent
Printing Resistance:	Equivalent to waterborne, worse than nitrocellulose
Adhesion:	Equivalent
Appearance:	
Flow	Equivalent to waterborne, better than nitrocellulose
Color	Equivalent
Depth	Equivalent or Better
Color change	Superior
Hot/Cold check	Equivalent or Better
Sprayability	Equivalent
Sag	Equivalent to waterborne, worse than nitrocellulose

3.2.2 Varnish

Application Method

Surface Preparation: Bare wood surfaces were sanded to a smooth uniform surface with 120-grit sandpaper. All dust was removed. For stained surfaces, the stain was allowed to dry overnight. The sanding sealers were then applied, and sanded lightly with 220-grit sandpaper, and the dust was removed.

Application: The varnish was a two-component epoxy coating (Part A and Part B). The mix ratio was 2 parts of B to one part of A. While stirring Part A, Part B was slowly added, and mixed for 3-4 minutes. The varnish was used within 4 hours from the time of mixing and any catalyzed varnish was discarded. The varnish was applied by conventional air gun (number 66 tip). The varnish was applied approximately three mils thick per wet coat. Two coats were applied over bare wood. For system application, two coats over a sealer and a stain were applied for appearance and durability.

Test Results

<u>Comparative Tests Performed</u>	<u>New Coating Performance</u>
Wet Film Thickness:	Equivalent
Freeze/Thaw:	Inferior
Dry Time:	
Set to touch	Equivalent to waterborne, longer than solvent based
Tack free	Equivalent to waterborne, longer than solvent based
Dry through	Equivalent to waterborne, longer than solvent based
Dry hard	Equivalent to waterborne, longer than solvent based
Gloss:	Equivalent to waterborne, lower than solvent based
Grain Raising:	Superior
Orange Peel:	Equivalent
Printing Resistance:	Equivalent
Adhesion:	Equivalent or better

Appearance:

Flow	Inferior
Color	Equivalent
Depth	Equivalent to waterborne, worse than solvent based
Color change	Superior
Hold/check	Equivalent
Sprayability	Equivalent
Sag	Superior
Pot life	Inferior due to two-component system

3.2.3 Exterior Opaque Stain

Application Method

Surface Preparation: New wood surfaces were prepared by removing all loose wood fibers with a stiff bristle brush. All surfaces were clean and free of all dust, mildew, oil, soot, and other contaminants. Smooth wood and mill glazed wood was sanded.

Application: The stain was stirred thoroughly, and applied using a synthetic bristle brush. On rough woods, the stain was back brushed while wet to force the stain into all the texture of the wood. Two coats were applied to new rough sawn woods.

Test Results

<u>Comparative Tests Performed</u>	<u>New Coating Performance</u>
Dry Time:	
Set to touch	Inferior
Tack free	Quicker than some but not as quick as others
Dry through	Quicker than some but not as quick as others
Dry hard	Quicker than some but not as quick as others
Grain Raising:	Equivalent
Freeze/Thaw:	Inferior
Coating Penetration:	Equivalent or Better
Stain Blocking:	
Extent	Equivalent
Severity	Equivalent
Mildew/Fungus Resistance:	Equivalent to waterborne, worse than solvent based
Dirt Pick-up:	Equivalent or worse
Color change:	Superior
Moisture Resistance:	Equivalent
UV Resistance:	Equivalent or better

3.2.4 Exterior Semitransparent Stain

Application Method

Surface Preparation: New wood surfaces were prepared by removing all loose wood fibers with a stiff bristle brush. All surfaces were clean and free of all dust, mildew, oil, soot, and other contaminants. Smooth wood and mill glazed wood was sanded.

Application: The stain was stirred thoroughly, and applied using a synthetic bristle brush. On rough woods, the stain was back brushed while wet to force the stain into all the texture of the wood. Two coats were applied to new rough sawn woods.

Test Results

<u>Comparative Tests Performed</u>	<u>New Coating Performance</u>
Dry Time:	
Set to touch	Better
Tack free	Better
Dry through	Equivalent or Better
Dry hard	Equivalent or Better
Grain Raising:	Equivalent
Freeze/Thaw:	Inferior
Coating Penetration:	Equivalent or Better
Stain Blocking:	
Extent	Equivalent or worse
Severity	Equivalent or worse
Mildew/Fungus Resistance:	Inferior
Dirt Pick-up:	Equivalent or worse
Color change:	Best
Moisture Resistance (final appearance):	Better
UV Resistance (final appearance):	Better

3.2.5 Interior Semitransparent Stain

Application Method

Surface Preparation: New wood surfaces were prepared by removing all loose wood fibers with a stiff bristle brush. All surfaces were cleaned and free of all dust, mildew, oil, soot, and other contaminants.

Application: The stain was stirred thoroughly, and applied using a nylon polyester brush. The stain was allowed to penetrate until the desired color was achieved but was not allowed to dry out. While the stain was still wet, excess stain was removed using a clean cloth. During the removal of excess stain, the wood was wiped in the direction of the wood grain. A second application of the stain was then applied to intensify the color

by letting the first coat dry for 1 hour. The stain was allowed to dry at least 3 hours before it was topcoated.

Test Results

Comparative Tests Performed	New Coating Performance
Dry Time:	
Set to touch	Best
Tack free	Best
Dry through	Better
Dry hard	Better
Grain Raising:	Equivalent or worse
Freeze/Thaw:	Equivalent
Finish:	Equivalent
Grain Definition:	Equivalent or worse

3.2.6 Sanding Sealer

Application Method

Surface Preparation: The wood surfaces were clean and dry. For new wood, the surface was sanded lightly with 120-grit sandpaper with the direction of the grain. All surfaces were cleaned and free of all dust, mildew, oil, soot, and other contaminants. For stained surfaces, the stain was allowed to dry overnight before the sealer was applied.

Application: The sanding sealer was stirred thoroughly and applied using a conventional air gun (number 66 tip). Approximately 3-4 mils of wet spray coat was applied. The sealer was sanded after being allowed to dry for 3 hours. A minimum amount of grain rise occurred. The sealer was sanded with 220 grit sandpaper before the topcoat was applied.

Test Results

Comparative Tests Performed	New Coating Performance
Freeze/Thaw:	Equivalent
Dry Time:	
Set to touch	Equivalent or worse
Tack free	Equivalent or worse
Dry through	Equivalent or worse
Dry hard	Equivalent or worse
Grain Raising:	Equivalent or worse
Appearance:	Equivalent
Flow	Equivalent
Color change	Better
Sprayability	Equivalent

Sag

Equivalent or worse

3.2.7 Waterproofing Sealer

Application Method

Surface Preparation: New wood surfaces were prepared by removing all loose wood fibers with a stiff bristle brush. All surfaces (wood and concrete) were clean and free of all dust, mildew, oil, soot, and other contaminants.

Application: The stain was stirred thoroughly and applied using a brush. The sealer was applied until a puddle remained on the surface for 2 minutes. Any residual sealer was then redistributed and the excess was removed.

Test Results for Wood Substrate

Comparative Tests Performed	New Coating Performance
Freeze/Thaw:	Worse
Moisture Vapor Transmission:	Equivalent or Better
Water Repellent Efficiency:	Better
Swell:	Equivalent
Water Uptake:	Equivalent

Test Results for Concrete

Comparative Tests Performed	New Coating Performance
Freeze/Thaw:	Worse
Moisture Vapor Transmission:	Equivalent or Better
Beading:	Equivalent or Better
Coating Penetration:	Better

3.2.8 System 1 Test Results

System 1 is comprised of stain, sanding sealer, and two coats of varnish.

Comparative Tests Performed	New Coating Performance
Mar Resistance:	Equivalent or Better
Wet Film Thickness:	Equivalent
Color change	Equivalent
Household Chemical Resistance:	
Water	Equivalent or Better
Windex	Equivalent or Better
Espresso	Equivalent or Better
Mustard	Better
Vodka	Equivalent
Grease	Equivalent
Motor Oil	Equivalent
Pencil Hardness:	Equivalent or Better

Adhesion:	Equivalent or Better
Printing Resistance:	Equivalent
Appearance:	
Depth	Equivalent
Orange Peel	Equivalent
Gloss	Equivalent or worse

3.2.9 System 2 Test Results

System 2 is comprised of stain, sanding sealer, and two coats of lacquer.

<u>Comparative Tests Performed</u>	<u>New Coating Performance</u>
Mar Resistance:	Equivalent or Worse
Wet Film Thickness:	Equivalent
Color change	Equivalent
Household Chemical Resistance:	
Water	Equivalent or Worse
Windex	Equivalent or Worse
Espresso	Equivalent or Worse
Mustard	Equivalent
Vodka	Inferior
Grease	Equivalent
Motor Oil	Equivalent
Pencil Hardness:	Equivalent or Better
Adhesion:	Equivalent or Better
Printing Resistance:	Equivalent or Worse
Appearance:	
Depth	Equivalent or Better
Orange Peel	Equivalent or Better
Gloss	Equivalent or Worse

3.2.10 System 3 Test Results

System 3 is comprised of stain, sanding sealer, and three coats of lacquer.

<u>Comparative Tests Performed</u>	<u>New Coating Performance</u>
Mar Resistance:	Equivalent or Worse
Wet Film Thickness:	Equivalent
Color change	Equivalent
Household Chemical Resistance:	
Water	Equivalent or Worse
Windex	Equivalent or Worse
Espresso	Equivalent
Mustard	Equivalent or Worse
Vodka	Equivalent or Worse
Grease	Equivalent or Better
Motor Oil	Equivalent
Pencil Hardness:	Equivalent or Better
Adhesion:	Equivalent or Better
Printing Resistance:	Equivalent or Better

Appearance:	
Depth	Equivalent or Better
Orange Peel	Equivalent or Better
Gloss	Equivalent or Worse

3.3 Comparative Repair/Refinishing

There are many reasons for refinishing or repair. Typical reasons for refinishing include:

Damage caused in manufacturing (e.g., glue marks, putty marks, scratches, gouges, nail or screw holes, poor joints).

Flaws in the grains of the wood (e.g., sap wood, light vs. dark grain, splits or cracks). Some may just require shading in the finishing process.

Handling or stacking damage (e.g., printing/blocking, scuff marks, light scratches, deep scratches, gouges, chips, rub marks).

Flaws in the finish process (e.g., incomplete finishing, runs, sags, over spray).

Usually, the defects from items one and two above are found and repaired in the finish room. Some of the flaws described above are very easy to repair, while others require a great deal of skill. In general, solvent-based coatings are easier to repair since a new layer of coatings can merge with the existing layer (i.e. the existing layer opens up after solvent contact). Water-based coatings typically require sanding between new layer and existing layer.

Three popular commercially available coating systems (both lacquer and varnish) were tested side-by-side with no-VOC lacquer and varnish topcoat systems for repair and refinishing. The system panels used for repair testing were prepared for side-by-side laboratory comparison testing. All side-by-side repair tests were conducted in ADCO's laboratory (Oakland, CA), by ADCO staff. Using the panel made to check chemical resistance (Oak plywood panel coated with semi-transparent stain, sanding sealer and topcoat), a scratch was applied at least one inch long across the grain. A scratch was made perpendicular to the grain using the loaded beam apparatus mentioned in the mar resistance method. The beam was loaded with a 1000 grams weight and the marking tool was a steel #13 yarn needle at 45° to surface. Sand paper (#220 grit) was used to lightly sand the scratch area to improve the adhesion. After the panel was cleaned and dust was removed, a first topcoat was brushed on to fill the scratch. After the first coat dried, the second coat was then sprayed on. Three sets of pictures were taken for each panel (before the scratch, after the scratch, and after the repair). In a typical field application, only topcoat is used to repair a scratch. If there is a large area of damage, then stain, sanding sealer, and topcoat are used for the repair.

Repair procedures for finishes are very system dependent. If an applicator is more experienced with one type of finish, it will be easier for him to repair. However, the

learning process is necessary for a good repair. The repair test was homogenized to treat all finishes the same way. This may not be fair for all coatings (realizing that most coatings were developed for some specific practice or property). Each coating system was composed of interior semitransparent stain, sanding sealer, and topcoat. All coating systems tested for repair and refinishing were examined by visual analysis in terms of color difference on repair, gloss difference on repair, speed of repair, ease to repair, and overall appearance. The following tables summarized results of all coating systems tested for repair and refinishing.

Table 3-3 Varnish System Summary

Manufacturer	Stain / Sanding Sealer /Varnish - 2 coats	Repair and Refinishing (0-5, 5-best)				
		Ease of Repair	Speed of Repair	Gloss Difference of Repair	Color Difference of Repair	Overall Appearance
S1-A	WST-5 / WSS-9D / WTC-99	2	4	4	4	5
S1-B	Wood Finish# 224 / Classic FastDry Sanding Sealer / Fast Drying Polyurethane	4	2	4	4	3
S1-C	Stainseal II/ Pro Finisher sanding sealer # 13-7163 / Heirloom Varnish	4	1	3	2	2
S1-D	Diamond wood stain / Pro Finisher sanding sealer #13-7163 / Mega waterborne floor finish	5	4	4	4	4

S1-C varnish took the longest time to dry and left a noticeable patch (the picture did not show the patch, but the physical patch was darker in color with a bumpy surface which resulted in a gloss patch). S1-A varnish repaired well but had the highest use level because of the defined pot life (this is a two-component coating, unused coating was wasted after its pot life). S1-B polyurethane did well in the evenness of gloss but additional sanding was necessary to prevent an adhesion failure.

Table 3-4 Lacquer System Summary

Manufacturer	Stain / Sanding Sealer / Lacquer - 2 coats	Repair and Refinishing (0-5, 5-best)				
		Ease of Repair	Speed of Repair	Gloss Difference of Repair	Color Difference of Repair	Overall Appearance
S2-A	WST-5 / WSS-9D / WLQ-6C	5	4	5	4	3
S2-B	Wood Finish# 224 / Classic FastDry Sanding Sealer / Polycrylic Finish	5	4	4	4	3
S2-C	Decolac II lacquer stain #LQ122 / 550 Crysteclear LQ 150-0 Sanding Sealer / 550 Crystaclear LQ 153-0	3	5	4	5	4
S2-D	Diamond wood stain / Pro Finisher S/S # 13-7163 / AQUAZAR waterborne urethane	5	4	4	4	5

S2-C lacquer had the highest use level because of its low solid content and the large area required for blending the topcoat. S2-D has the best overall appearance while S2-A has the best gloss difference after repair (see Appendix C for pictures taken before scratch, after scratch, and after repair).

3.4 Field Demonstration

The purpose of the demonstration was to obtain the impartial opinion of experienced painters on the performance of the new coatings in a real world (woodworking/painting facility) environment. The demonstration of the new coating system was conducted at Commercial Casework, Inc. in Fremont, California, on December 13, 2000. Commercial Casework manufactures high-end finished panels, desks, reception counters and other miscellaneous office furniture and architectural wood products. The painters of Commercial Casework, Inc conducted the field demonstration. The following summarizes the demonstration process.

Date: December 13, 2000

Place: Commercial Casework, Inc.
41780 Christy Street
Fremont, CA 94538

Present: Mr. Naveen Berry - SCAQMD
Mr. Rich Hosman - Commercial Casework, Inc.
Mr. Jeff Wong - Commercial Casework, Inc.
Mr. Guillermo Garcia - Commercial Casework, Inc.

Products used: New Lacquer (WLQ-6C)
New Varnish (WTC-99)
New Sanding Sealer (WSS-9D)
New Stain (WST-5)

		<u>Interior</u>	<u>Exterior</u>
Conditions:	Temperature:	72°F	50°F (estimated)
	Relative Humidity:	50%	90% (estimated)

This facility has an overhead heater at about 18 feet above the finished floor in the coating area. Two oak laminate panels were laid out on finishing racks. The panels were lightly sanded and dust was removed using pressurized air. The stains (WST-5) were applied to the wood products by rubbing with a rag until an even color was achieved. The stains were easy to work with, blended well, and gave a pleasing appearance.

Five minutes later, the sanding sealer (WSS-9D) was applied to all panels at package viscosity using a Binks 2000 cup gun (tip number 66). Sanding sealer dried in seven minutes. This was allowed to cure (about thirty minutes) before sanding. Using 280-grit sandpaper, the sanding sealer was easily sanded, resulting in a powder that was easily wiped off. No gumminess or sticky residue was noted.

After sanding and dusting, the new topcoats were applied using the same gun at package viscosity. One of the panels was coated with lacquer and the other with varnish. Results of the topcoat application are discussed below:

Lacquer System (WLQ-6C)

The first coat of lacquer was applied at 10:30 a.m. and dried at 10:42 a.m. There was some orange peel observed on the dried film (orange peel is an irregularity in the surface of a paint film resulting from the inability of the wet film to "level out" after being applied. Orange peel appears as a characteristically uneven or dimpled surface to the eye, but usually feels smooth to the touch.). The second coat was applied at 10:47 a.m. and dried at 11:00 a.m. The second coat exhibited some orange peel also. The third coat dried in approximately 12 minutes with improving flow and leveling. Depth also improved. The fourth coat dried in approximately 12 minutes with very good flow and depth. Gloss was about 85 on a 60 ° degree gloss meter. No orange peel was noted on the fourth coat.

Varnish System (WTC-99)

The first coat of the two-component varnish was applied at 10:34 a.m. and dried at 11:05 a.m. There was some initial milky appearance, which cleared upon curing. The second coat was applied at 11:06 a.m. and dried at 11:21 a.m. The second coat appeared milky but cleared upon curing. However, some yellowness was noted. Gloss was about 80 on a 60 ° degree gloss meter.

The personnel from Commercial Casework were impressed with the new wood coatings for the following reasons:

1. Stains dried very fast.
2. Sanding sealer applied easily and powdered very well.
3. Lacquer dried fast and was not milky.
4. Although slightly milky, after completely dry, the varnish dried fast with good appearance.
5. The absence of solvents results in a safer working environment .

The complete field demonstration results are summarized in Appendix D.

SECTION 4.0 - COST AND ENVIRONMENTAL ANALYSIS

4.1 Cost Comparison of Zero-VOC and Conventional Coatings

The new no-VOC coatings and the conventional coating systems (nitrocellulose system, high solid system, and hybrid system) were sprayed on wood panels. Tables 4-1a and 4-1b, 4-1c and 4-1d list comparisons of VOC contents, solid contents, and cost per gallon between conventional coatings and no-VOC wood coatings.

Table 4-1a Coating Comparisons – Lacquer

	No-VOC Coating	Conventional Coating		
	CWF - A	CWF – B	CWF - C	CWF - D
Coating VOC Content *	0 g/l	350 g/l	548 g/l	328 g/l
Material VOC Content	0 g/l	120 g/l	223 g/l	149 g/l
Solid Content (by Volume)**	28%	27.5 %	13.5 %	28%
Cost ***	\$32.99/gal	\$29.97/gal	\$22.55/gal	\$29.97/gal

Table 4-1b Coating Comparisons – Varnish

	No-VOC Coating	Conventional Coating		
	V - A	V – B	V - C	V - D
Coating VOC Content *	0 g/l	450 g/l	350 g/l	250 g/l
Material VOC Content	0 g/l	350 g/l	328 g/l	100 g/l
Solid Content (by Volume) **	30%	58%	56 %	30 %
Cost***	\$42.99/gal	\$32.47/gal	\$29.60/gal	\$54.96/gal

TABLE 4-1c Coating Comparisons – Sanding Sealer

	No-VOC Coating	Conventional Coating		
	SS - A	SS - B	SS - C	SS - D
Coating VOC Content *	0 g/l	523 g/l	550 g/l	350 g/l
Material VOC Content	0 g/l	523 g/l	219 g/l	100 g/l
Solid Content (by Volume) **	25%	31%	13%	22%
Cost***	\$26.99/gal	\$33.96/gal	\$21.65/gal	\$18.97/gal

Table 4-1d Coating Comparisons – Interior Semi-Transparent Stain

	No-VOC Coating	Conventional Coating		
	STS - A	STS - B	STS - C	STS - D
Coating VOC Content *	0 g/l	485 g/l	720 g/l	300 g/l
Material VOC Content	0 g/l	330 g/l	120 g/l	45 g/l
Solid Content (by Volume) **	10%	19.3%	4%	6%
Cost***	\$12.99/qt	\$5.97/qt	\$10.13/qt	\$12.97/qt

- * Coating VOC (g/l), excluding water and exempt compounds, reported from Manufacturer Product Data Sheet
- Material VOC (g/l) from Manufacturer Product Data Sheet and telephone survey
- ** Solid content (by volume) reported from Manufacturer Product Data Sheet
- *** Retail price from store and telephone survey

Table 4-2a and 4-2b summarize the costs associated with replacing conventional coating systems with the new no-VOC coating system.

Table 4-2a Cost Comparison of Varnish Systems

Varnish System	No-VOC Coating	Conventional Coating		
	S1-A	S1-B	S1-C	S1-D
Top Coat (\$/gal)	\$42.99	\$32.47	\$29.60	\$54.96
Sanding Sealer (\$/gal)	\$26.99	\$33.96	\$21.65	\$18.97
Stain (\$/qt)	\$12.99	\$5.97	\$10.13	\$12.97
Top Coat Usage ¹ (gallon)	1.00	0.52	0.54	1.00
Sanding Sealer Usage ¹ (gallon)	0.50	0.40	0.96	0.57
Stain Usage ¹ (gallon)	0.25	0.13	0.63	0.42
Estimated System Usage (gallon)	1.75	1.05	2.12	1.98
Relative Usage vs. No- VOC Coating	1.00	0.60	1.21	1.13
System Price ²	\$69.48	\$33.58	\$62.00	\$87.36
Relative Coating Cost ³	100.00%	48.34%	89.24%	125.74%

Table 4-2b Cost Comparison of Lacquer Systems

Lacquer System	No-VOC Coating	Conventional Coating		
	S2-A	S2-B	S2-C	S2-D
Top Coat (\$/gal)	\$32.99	\$29.97	\$22.55	\$29.97
Sanding Sealer (\$/gal)	\$26.99	\$33.96	\$21.65	\$18.97
Stain (\$/qt)	\$12.99	\$5.97	\$10.13	\$12.97
Top Coat Usage ¹ (gallon)	1.00	1.02	2.07	1.00
Sanding Sealer Usage ¹ (gallon)	0.50	0.40	0.96	0.57
Stain Usage ¹ (gallon)	0.25	0.13	0.63	0.42
Estimated System Usage	1.75	1.55	3.66	1.98
Relative Usage vs. No-VOC Coating	1.00	0.89	2.09	1.13
System Price ²	\$59.48	\$47.30	\$92.91	\$62.37
Relative Coating Cost ³	100.00%	79.53%	156.22%	104.86%

Notes:

- 1 This usage estimate is based on solid content (by volume) of each coating compared with the solid content (by volume) of the no-VOC coating.
- 2 System cost is estimated by adding topcoat, sanding sealer, and stain costs for estimated system usage.
- 3 This cost estimate does not include the benefit of increased productivity. By switching to no-VOC coatings, the productivity is no longer limited by the coating process since the maximum number of products sprayed per day can increase.

This new coating system unit price (cost per gallon) is lower than the unit price of the hybrid system but higher than those of the solvent-based coating systems on the market. However, once all other long-term cost savings are factored in (no emission fees, and no disposal fees), this new coating system price is more attractive. In addition, productivity can be increased due to unlimited no-VOC coating usage (no VOC emissions permit ceiling for this new coating system). The successful side-by-side comparison and repair/refinishing tests, field demonstration, and cost comparison clearly demonstrate that this no-VOC wood coating system is a good alternative to other popular more polluting commercial wood coatings. By using this new, promising no-VOC water-based coating technology, significant reductions in air emissions, hazardous wastes, and health risk could be achieved. As the limits on VOC contents of lacquer,

varnish, sanding sealer, waterproofing sealer, opaque stain and semitransparent stain are reduced, there will be an increased incentive to manufacture this no-VOC coating system. This new technology is ready for large scale commercialization due to the availability of the resin RESILEX[®], and competitive material costs, existing capital outlay capability, and reasonable labor costs.

4.2 Environmental Impact Assessment

The following sections focus primarily on the major environmental impacts (benefits) from replacing traditional solvent-based coatings with the new non-VOC coatings. Whenever possible, emission data available from the ARB and/or AQMD are used to quantify the environmental benefits resulting from employing this new non-VOC and non-HAPs coating technology. Using a “simplified” life-cycle assessment (LCA) methodology, the environmental impacts analysis accounts for differences in coatings impacts when compared to the new coating system. Impacts studied include:

- Air Quality Impacts
- Water Quality Impacts
- Waste Impacts
- Risks

In addition to the environmental benefits, the new no-VOC wood coating is in compliance with the current and future VOC limits of the AQMD Rule 1113 for architectural coatings.

4.2.1 Air Quality Impacts

Traditional coating technologies emit large quantities of air pollutants through the volatilization of organic solvents and carriers. These air pollutants include VOCs, HAPs, and ozone depleting compounds. VOCs react photochemically with oxides of nitrogen to form ozone, a reactive compound that irritates human tissue and causes damage to plant life. HAPs emitted from coatings affect health and safety of workers in the workplace and in surrounding areas. Ozone-depleting compounds deplete the stratosphere ozone layer, which protects life from solar UV radiation. Since traditional solvent-based coatings are widely used in many commercial and industrial facilities, the environmental benefit from the use of the new coatings is significant, especially in localized industrial areas in California, such as the South Coast Air Basin.

VOCs generated from the application, curing, handling and storage of coatings combine with nitrogen oxides, and combustion pollutants, to form ozone. Ozone causes shortness of breath, kills lung cells, and is suspected of causing premature aging of the lungs. VOCs also contribute to the formation of particulate pollution, or PM₁₀, which is linked to premature deaths in the South Coast Air Basin. Since homeowners and painting contractors like to paint during good weather, VOC emissions from architectural coatings are highest during summer, when ozone pollution is at its worst. Although the average VOC content in architectural coatings has fallen in recent years due to

environmental regulations, the total VOC emissions from architectural coatings are expected to increase in the South Coast Air Basin due to population and housing growth.

The development, demonstration and commercial use of zero-VOC coatings will result in a reduction of VOC emissions from the control measures stipulated in the 1999 AQMP. According to the 1999 ARB survey of 1996 coatings, the VOC emissions from these coatings are over 5 tons per day in the South Coast Basin. If new coating systems (less than 50 g/l) are successfully implemented, over 2.56 tons per day of further VOC emissions reduction from these new coating categories beyond potential reduction with future rule limit would be achieved..

4.2.2 Water Quality Impacts

Use of traditional coatings has the potential for ground water contamination due to the need for solvent thinning and cleanup. Also, the transportation of spent solvent on roads to distant Class I disposal facilities raises the risk of spills and potential exposure of nearby communities to environmental and health risks. Because the new non-VOC coatings do not generate solvent laden hazardous waste, the risk associated with ground water contamination would be eliminated.

4.2.3 Waste Disposal Impacts

There three potential sources of hazardous waste generation from the use of traditional solvent-based coatings- (1) the unused coating containing hazardous solvents, (2) spray booth filters contaminated with solvent-laden particulates, and (3) hazardous spent carbon from carbon adsorbers, if used to control the VOC emissions. Since the new coatings contain no VOCs and HAPs, the generation of hazardous wastes is eliminated, which contributes to environmental as well as coat benefits.

4.2.4 Risks

Use of traditional solvent-containing coatings may have the potential to expose workers and the surrounding community to health and safety risks. This is primarily due to the concentration of VOCs in the air-stream resulting from the coating application and/or during the handling, storage, and disposal of the solvent-laden waste material. The risks include human health, and fire/explosion risks.

4.2.4.1 Human Health Risk

The traditional organic solvent-based coatings contain VOCs of which many are HAPs. Human exposure to these HAPs is a potential human health risk. The greatest risk, based on potential exposure, would be to the coating application workers, followed by the plant workers, and finally the surrounding community. The potential human health risk can be determined following identification of HAPs in each coating and the estimate of potential exposure using the appropriate air dispersion models. Specialized personal

protection equipment (PPE) may be necessary to protect application workers and anyone else with a potential exposure to a concentrated VOC/HAP stream, e.g., spray booth exhaust stream. Replacing the solvent-based coatings with new coatings without HAPs can mitigate this human health risks.

4.2.4.2 Explosion/Fire Risk

Traditional solvent-based coatings contain flammable VOCs and pose a potential explosion/fire hazard. During application and drying in an enclosure, the risk is significantly greater due to the volatilization of the flammable solvents. In addition, waste material that contains residual VOCs (e.g., spray booth filters) remains a potential explosion/fire hazard and must be handled, stored, and disposed of according to flammable hazardous waste regulations. Facilities are required to maintain an emergency response management plan (such as a Fire Department Business Plan), and are also required to observe and maintain safety procedures in the work area.

These safety risks, and many administrative tasks associated with handling VOC-based coatings can be eliminated if the non-VOC coatings are substituted in the workplace.

SECTION 5 - CONCLUSION AND RECOMMENDATIONS

1. The goal of the project was to develop and demonstrate zero-VOC or low-VOC coatings (varnish, lacquer, stains, waterproof sealers and sanding sealers) to further reduce VOC emissions in the South Basin. The target in developing the coatings was to achieve a performance level equal to, or better than similar coatings currently used by the industry. Laboratory analysis confirmed that these new coatings formulated for this project have VOC contents of less than 10 g/l (calculated from GC/MS analysis results).
2. Most performance characteristics of this new no-VOC wood coating system (including adhesion, beading, chemical resistance, coating penetration, dirt pick-up, dry time, mar resistance, moisture vapor transmission, stain blocking, print resistance, swelling, water uptake, and overall appearance) are equivalent to those of commercial coatings based on the side-by-side comparative testing results. Advantages of these no-VOC coatings include better grain raising for varnish, less color change (for lacquer, varnish, and sanding sealer), better moisture/UV resistance for exterior semitransparent stain, and better water repellent efficiency for waterproofing sealer. However, the dry time, freeze/thaw properties, pot life, mildew/fungus resistance, printing resistance, and stain blocking properties of these no-VOC waterborne coatings are not as good as those of solvent-based coatings.
3. Three popular commercially available coating systems (both lacquer and varnish) were tested side-by-side with no-VOC lacquer and varnish topcoat systems for repair and refinishing. This new no-VOC varnish system showed the best overall appearance after repair, but had the highest coating usage because the two-component coating resulted in a limited pot life. The new no-VOC Lacquer system was the easiest to repair and showed the best gloss after repair.
4. In order to obtain the impartial opinion of experienced painters on the performance of the new coatings, the painters of Commercial Casework, Inc. in Fremont, California conducted a field demonstration of the new coating system as part of this study. The personnel from Commercial Casework were impressed with the new wood coatings due to fast dry time, ease of use, and the safer working environment resulting from the absence of solvents.
5. This new coating system unit price (cost per gallon) is lower than the unit price of the hybrid system, but higher than those of the solvent-based coating systems on the market. However, once all other long-term cost savings are factored in (no emission fees, and no disposal fees), this new coating system price is more attractive. In addition, with the elimination of VOC emissions ceiling, productivity can be increased due to unlimited no-VOC coating usage. Cumulative environmental impacts on this no-VOC coating system are insignificant, and no significant project-specific cost impacts are anticipated.

6. The development, demonstration and commercial use of zero-VOC coatings could potentially result in VOC emission reduction from the control measures in the 1999 AQMP. According to the 1999 ARB survey of 1996 coatings, the VOC emissions from the categories covered by this project are over 5 tons per day in the South Coast Basin. If new coating systems (less than 50 g/l) are successfully implemented, over 2.56 tons per day of further VOC emissions reduction from these new coating categories beyond potential reduction with future rule limit would be achieved. By using this new, promising no-VOC water-based coating technology, the anticipated air emissions reduction and health risk reduction could be achieved. Therefore, commercialization of the proposed technology will provide an alternative for compliance with current and future emission standards for coating operations imposed by federal, state, and local government agencies.

Appendix A

Side-by-side Comparison Testing Protocol

**DEVELOPMENT AND DEMONSTRATION OF
ZERO- AND LOW-VOC RESIN TECHNOLOGY
FOR ADVANCED CONTROL MEASURE DEVELOPMENT**

Final Test Protocol

Prepared for:

**South Coast Air Quality Management District
21865 East Copley Drive
Diamond Bar, CA 91765**

AQMD Contract #99143

Prepared by:

**Program Manager
Eddy Huang, Ph.D.**

**AVES, an Affiliate of ATC Associates Inc.
50 E. Foothill Boulevard
Arcadia, CA 91006
(626) 447-5216**

A. SELECTED COATINGS FOR TESTING

A1. Lacquer (Clear Wood Finish)

Manufacturer	Lacquer
CWF-A	WLQ-6C
CWF-B	Polycrylic Clear Gloss
CWF-C	550 Crystaclear LQ 153-0
CWF-D	Aquazar Polyurethane Gloss

A2. Varnish

Manufacturer	Varnish
V-A	WTC-99
V-B	Wood Classics FastDry Polyurethane Gloss ¹
V-C	Heirloom Gloss ¹
V-D	MegaWaterborne ¹

A3. Exterior Opaque Stains

Manufacturer	Opaque Stain
EOS-A	WST-4
EOS-B	Cuprinol Solid Color ¹
EOS-C	6520 Series ^{1,2}
EOS-D	Acrylic Latex Stain ¹

A4.1 Exterior Semi-Transparent Stains

Manufacturer	Exterior Semi-Transparent Stain
ESTS-A	EXTSTSTN
ESTS-B	Wood Scapes A15T5 ¹
ESTS-C	6380 Series ^{1,2}
ESTS-D	Oil Stain Redwood #704

A4.2 Interior Semi-Transparent Stains

Manufacturer	Interior Semi-Transparent Stain
ISTS-A	WST-5 ³
ISTS-B	Wood Finish Special Walnut
ISTS-C	Decolac II Stain LQ 122
ISTS-D	Diamond Wood Stain
ISTS-E	Stainseal II Walnut

A5. Sanding Sealers

Manufacturer	Sanding Sealer
SS-A	WSS-9D
SS-B	Wood Classic FastDry B26V43 ¹
SS-C	Crystaclear LQ 150-0
SS-D	Pro Finisher Waterborne

A6. Waterproofing Sealers

Manufacturer	Water Proofing Sealer
WS-A	WPS-2
WS-B	Water Proofing Sealer (Water Based) ⁴
WS-C	Waterseal Ultra ⁴
WS-D	#92 Water Proofing Clear

A7. System #1

Manufacturer	Stain	Sanding Sealer	Varnish
S1-A	WST-5	WSS-9D	WTC-99
S1-B	Wood Finish # 224	Wood Classics FastDry Sanding	Wood Classics FastDry Polyurethane
S1-C	StainSeal II	Pro Finisher Sealer # 13-7163 ⁵	Heirloom Varnish
S1-D	Diamond Wood Stain	Pro Finisher Sealer # 13-7163	Mega Waterborne Finish

A8. System #2

Manufacturer	Stain	Sanding Sealer	Lacquer (2 Coat)
S2-A	WST-5	WSS-9D	WLQ-6C
S2-B	Wood Finish # 224	Wood Classics FastDry Sanding	Polycrylic Clear Gloss
S2-C	Decolac II LQ 122	550 Crystaclear LQ 150-0	550 Crystaclear LQ 153-0
S2-D	Diamond Wood Stain	Pro Finisher Sealer # 13-7163	Aquazar Waterborne Urethane

A9. System #3

Manufacturer	Stain	Sanding Sealer	Lacquer (3 Coat)
S3-A	WST-5	WSS-9D	WLQ-6C
S3-B	Wood Finish # 224	Wood Classics FastDry Sanding	Polycrylic Clear Gloss
S3-C	Decolac II LQ 122	550 Crystaclear LQ 150-0	550 Crystaclear LQ 153-0
S3-D	Diamond Wood Stain	Pro Finisher Sealer # 13-7163	Aquazar Waterborne Urethane

Note:

1. Selected from manufacturers according to their VOC compliance specifications.
2. Selected based on product's availability.
3. ADCO's WST-5 will be used for interior testing only. ADCO's semi-transparent stain will be reformulated as EXTSTSTN and tested for exterior use.
4. Selected from the CARB "Suggested Control Measure for Architectural Coatings" February 2000 issue.
5. This manufacturer does not have a sanding sealer for Varnish.

B. TESTS FOR INDIVIDUAL NEW & COMPARATIVE COATINGS

Test methods and descriptions of each parameter are described below:

B1. Lacquer

Wet Film Thickness – ASTM D1212

Dry Time – ASTM D 1640

- Set to touch
- Tack free
- Dry through
- Dry hard
- Recoat time

Grain Raising

Freeze/Thaw (For waterborne only) - ASTM D2243

Orange Peel

Printing Resistance – ASTM D2091

Gloss – ASTM D523

Adhesion (Parallel Groove Adhesion) – ASTM D3359

Appearance

- Flow Problems
- Color
- Depth
- Color Change - ASTM D2244
- Hot/Cold Check - ASTM D1211
- Sprayability
- Leveling/Sagging

B2. Varnish

Wet Film Thickness – ASTM D1212

Dry Time – ASTM D 1640

- Set to touch
- Tack free
- Dry through
- Dry hard

Recoat time

Grain Raising

Freeze/Thaw (For waterborne only) - ASTM D2243

Orange Peel

Printing Resistance – ASTM D2091

Gloss – ASTM D523

Adhesion (Parallel Groove Adhesion) – ASTM D3359

Appearance

Flow Problems

Color

Depth

Color Change - ASTM D2244

Hot/Cold Check - ASTM D1211

Sprayability

Leveling/Sagging

B3. Exterior opaque stains

Dry Time – ASTM D 1640

Set to touch

Tack free

Dry through

Dry hard

Grain Raising

Freeze/Thaw (For waterborne only) - ASTM D2243

Penetration into Substrate – Observe the depth of stain penetrating to the substrate at the cross section.

Stain Blocking – Calcoast⁶ Method

Mildew/Fungus Resistance – ASTM D3273-94

Dirt Pickup – Carbon Black Method

Color Change - ASTM D2244

UV Resistance (G53) – ASTM G53-88

Moisture Resistance – Combined with UV Resistance

B4.1 Semi-transparent stains (Exterior)

Dry Time – ASTM D 1640

Set to touch

Tack free

Dry through

Dry hard

Grain Raising

Freeze/Thaw (For waterborne only) - ASTM D2243

Penetration into Substrate – Observe the depth of stain penetrating to the substrate at the cross section.

Stain Blocking – Calcoast⁶ Method

Mildew/Fungus Resistance – ASTM D3273-94

Dirt Pickup – Carbon Black Method

Color Change - ASTM D2244

Appearance – ASTM G53-88

B4.2 Semi-transparent stains (Interior)

Dry Time – ASTM D 1640

Set to touch

Tack free

Dry through

Dry hard

Grain Raising

Freeze/Thaw (For waterborne only) - ASTM D2243

Finish

Grain Definition

Application Method

B5. Sanding sealers

Dry Time – ASTM D 1640

Set to touch

Tack free

Dry through

Dry hard

Recoat time

Grain Raising

Freeze/Thaw (For waterborne only) - ASTM D2243

Appearance

Flow Problems

Color

Depth

Color Change - ASTM D2244

Hot/Cold Check - ASTM D1211

Sprayability

Leveling/Sagging

Sandability

B6. Waterproofing sealers (wood substrate)

Freeze/Thaw – ASTM D2243

Moisture Vapor Transfusion - ASTM D 1653

Water Repellent Efficiency – ASTM D5401

Swelling - ASTM D4446

Water uptake

B7. Waterproofing sealers (concrete/masonry)

Freeze/Thaw – ASTM D2243

Moisture Vapor Transfusion - ASTM D 1653

Beading – Document how well water beads on the coating surface.

Coating Penetration

B8. Tests for systems

System #1 Semi - Transparent Stain (Interior)/Sanding Sealer/Varnish

System#2 Semi – Transparent Stain (Interior)/Sanding Sealer/Lacquer (2 Coats)

System#3 Semi – Transparent Stain (Interior)/Sanding Sealer/Lacquer (3 Coats)

Scrape/Mar Resistance – ASTM D2197

Wet Film Thickness – ASTM D1212

Color Change - ASTM D2244-73

Household Chemical Resistance (Specify chemicals & stains) – ASTM D1308

Pencil Hardness after 2 weeks ambient cure – ASTM 3363

Parallel Groove Adhesion – ASTM D3359

Printing resistance – ASTM D2091-88

Appearance

Depth

Orange Peel

Gloss 60° - ASTM D523-89

Note:

6. The following is the test method used by Calcoast to evaluate the ability coatings to resist stain bleed-through from a wood substrate.
 - Redwood and rough cedar panels (0.5" x 3" x 4") are coated on both sides (applying a new exterior stain on one side of the panel and a corresponding selected stain on the opposite side of the same panel) and allowed to cure as per the manufacturer's recommendations (minimum 1 week cure time allowed).
 - Prepared panels are placed in a humidity chamber which is maintained at a constant 100 °F and a minimum 95% Relative Humidity (saturation).
 - All samples are evaluated on a weekly basis. Evaluation is by visual inspection, supplemented with microscopic examination as necessary (e.g. to distinguish between stain bleed-through and exposure related surface discoloration).

C. SUBSTRATE

Testing will be conducted on 2 different panels for each test:

- Oak and maple are proposed for interior coating.
- Rough cedar and redwood are proposed for exterior opaque stains/exterior semi-transparent stains
- Concrete/masonry, rough cedar, and redwood are proposed for waterproofing sealers

Appendix B

Side-by-side Comparison Testing Results

Category A1 - Clear Wood Finish (CWF)

Manufacturer	Trade name	Reported V.O.C. / (g/l) type	ASTM D1212 Wet film thickness (mils)	Recoat time label claim	ASTM D1640 Dry times on sealed charts at 3 mils wet film			Grain raising ^a Birch plywood (0-5, 5-best)	ASTM D2243 Freeze-Thaw Resistance- cycles (0-5, 5-best)	Orange peel		ASTM D2091 Printing resistance		ASTM D523 Gloss 60 degree		ASTM D3359 Adhesion		Appearance ^[3]							
					Set to touch	Tack free	Dry through			Dry hard	Oak	Maple	Oak (0-3, 3-best)	Maple (0-3, 3-best)	Oak (0-100)	Maple (0-100)	Oak (0-5, 5-best)	Maple (0-5, 5-best)	Flow (0-5, 5-best)	Color	Depth	Color change ASTM D2244 (unit ΔE 0-best)	ASTM D1211 Hot/cold check (cycles)	Rating	Sprayability Equipment
CWF-A*	WLQ-6C	0 w/b ^[1]	3	2 hr	34 min	37 min	1.5 hr	2	2	No	No	2	2	56	74	5B	5B	5	Light color	Excellent	3.92	Pass 6 cycles	Very good	Cup gun Binks #2001	<3 mils
CWF-B	Polyurethane Clear Gloss	350 w/b	3	2 hr	33 min	40 min	1.5 hr	2	5	No	No	2	2	67	77	4B	2B	5	Light color	Foam problem	4.88	Pass 6 cycles	Very good	Cup gun Binks #2001	<3 mils
CWF-C	550 Crystalline Clear Gloss Lacquer LQ153-0	548 s/b ^[2]	3	45 min	7 min	15 min	20 min	2	N/A ^[2]	No	No	3	3	47	68	5B	5B	4	Light color	Lots of passes for 1 mil dry	5.23	Fail 5	Very good	HVLP Binks BBR	7 mils
CWF-D	Aquazur waterborne polyurethane Gloss	328 w/b	3	2 hr	30 min	35 min	1.5 hr	2	5	No	No	2	2	47	67	5B	5B	5	Light color	Excellent	6.85	Fail 4	Very good	Cup gun Binks #2001	<3 mils

[1] Waterborne. [2] Solvent-based. [3] No blistering, cracking, flakiness observed during test.

*a- refer to Summary of Non-standard Test Methods

*- No-VOC coating

Category A2 - Varnish (V)

Manufacturer	Trade name	Reported V.O.C. / (g/l) type	ASTM D1212 Wet film thickness (mils)	Re-coat time label claim	ASTM D1640 Dry times on sealed charts at 3 mils wet film			Grain raising Birch plywood (0-5, 5-best)	ASTM D2243 Freeze-Thaw Resistance-cycles (0-5, 5-best)	Orange peel		ASTM D2091 Printing resistance		ASTM D523 Gloss 60 degree		ASTM D3359 Adhesion		Appearance ^[4]							
					Set to touch	Tack free	Dry through			Dry hard	Oak	Maple	Oak (0-3, 3-best)	Maple (0-3, 3-best)	Oak (0-100)	Maple (0-100)	Oak (0-5, 5-best)	Maple (0-5, 5-best)	Flow (0-5, 5-best)	Color	Depth	Color change ASTM D2244 (unit ΔE 0-best)	ASTM D1211 Hot/cold check (cycles)	Rating	Sprayability Equip ment
V-A*	WTC-99	0 w/b ^[1]	4	3 hr	1.25 hr	6 hr	6 hr	4	N/A ^[2]	No	No	3	3	63	75	5B	5B	4	Light color	Not sharp as image	5.71	Pass 6 cycles	Very good	Cup gun Binks #2001	7 mils
V-B	Fast Drying Polyurethane gloss	450 s/b ^[2]	3	4 hr	50 min	1.5 hr	2.5 hr	2	N/A ^[2]	No	No	3	3	84	88	1B	0B	5	Low color	Excellent image	24.1	Pass 6 cycles	Very good	HVLP Binks BBR	<3 mils
V-C	Heirloom Gloss Varnish	350 s/b	4.5	16 hr	1 hr	5 hr	9 hr	2	N/A ^[3]	No	No	3	1	86	91	5B	5B	5	Quite amber	Sharp gloss	21.26	Pass 6 cycles	Very good	HVLP Binks BBR	<3 mils
V-D	Mega Waterborne	250 w/b	3	3 hr	30 min.	1.5 hr	2 hr	2	5	No	No	3	3	54	83	5B	5B	5	Light color	Lower build low color	9.27	Pass 6 cycles	Very good	Cup gun Binks #2001	<3 mils

[1] Waterborne. [2] Solvent-based. [3] Two components coating. [4] No blistering, cracking, flakiness observed during test.

*- No-VOC coating

Category A3 - Exterior Opaque Stains (EOS)

Manufacturer	Trade name	Reported V.O.C. (g/l), type	ASTM D1640				Grain raising ^{*2} Amount Wood Smooth cedar (0-5, 5-best)	ASTM D2243 Freeze-Thaw cycles (0-5, 5-best)	Coating Penetration Cedar / Redwood unit 1/1000 inch ^f	Stain blocking rating ^{*c} (0-4, 4-best) ^[3]				ASTM 3273-94 Mildew / Fungus Resistance (0-10, 10-best) ^[3]				Dirt pick-up rating (0-5, 5-best)	Color change ASTM D2244 (unit ΔE, 0-best) Redwood/Cedar	ASTM G53-88 ^{14, 5)} Appearance(0-5, 5-best) Redwood/cedar		
			Set to touch	Tack free	Dry through	Dry hard				Extent	Severity	1	2	3	4	1	2				3	4
EOS-A*	WST-4 (EXTOPSTN)	0 w/b ^[1]	2 hr	2 hr	3 hr	3 hr	3	1	4.7 / 5.7	cedar	cedar	cedar	cedar	4/4	4/4	8/10	6/10	6/6	4/4	2	0.52/1.58	5/4
EOS-B	Cuprinol Solid Color Deck Stain	96 before tint	15 min	25 min	40 min	40 min	3	5	1.9 / 4.7	cedar	cedar	cedar	cedar	4/4	4/4	10/10	10/10	8/10	6/8	2	0.35/6.33	5/4
EOS-C	O.V.T Solid Color Oil Stain Tile Red #6520	< 350 s/b ^[2]	1 hr	4 hr	7 hr	8 hr	3	N/A ^[2]	5.7 / 6.6	cedar	cedar	cedar	cedar	4/4	4/4	10/10	10/10	10/10	10/10	3	2.76/6.28	1/3
EOS-D	Premium Acrylic Latex Stain Solid Color Navajo Red #59660	76.8 w/b	15 min	20 min	45 min	1.25 hr	3	5	2.8 / 2.8	cedar	cedar	cedar	cedar	1/4	3/4	8/10	6/8	4/6	2/4	3	0.79/2.41	5/5

[1] Waterborne. [2] Solvent-based. [3] Duplicates [4] No cracking or peeling observed during the time period. [5] Moisture resistance was combined with UV resistance test.

*a, *b, *c - refer to Summary of Non-standard Test Methods.

* - No-VOC coating

Category A4.1 – Exterior Semi Transparent Stains (ESTS)

Manufacturer	Trade name	Reported V.O.C. / (g/l), type	ASTM D1640				Grain raising* (0 - 5, 5-best) cedar	ASTM D2243 Freeze-Thaw Resistance- (0-5, 5-best)	Coating Penetration unit l/1000 inch		Stain blocking rating (0-4, 4-best) ^[3]		ASTM 3273-94				Dirt pick-up rating ^a (0 - 5, 5-best)	Color change ASTM D2244 (unit ΔE, 0-best) Redwood/Cedar	ASTM G53-88 ^[4, 5] Appearance (0 - 5, 5-best) Redwood/cedar
			Dry times on sealed charts at 3 mils wet film		Amount Wood Smooth	Resistance- cycles			Cedar / Redwood	Extent	Severity	Mildew / Fungus Resistance (0-10, 10-best) ^[3]			Week No.				
Set to touch	Tack free	Dry through	Dry hard	redwood			cedar	redwood				cedar	1	2		3	4		
ESTS-A	EXTTSTN	0 w/b ^[1]	20 min	1.5 hr	1.5 hr	3	1	4.7 / 4.7	2/2	1/1	2/2	10/10	8 / 10	6 / 8	5 / 7	2	1.33/2.8	4/4	
ESTS-B	Woodscapes A1515 (tinted redwood)	475 w/b	30 min	1 hr	1.5 hr	3	5	3.8 / 4.7	3/3	4/4	3/3	10/10	8 / 10	8 / 10	8 / 8	2	5.05/6.26	3/3	
ESTS-C	Semitransparent stain #6380 redwood	< 350 s/b ^[2]	Over-night	Over-night	2 days	3	N/A	7.6 / 10.4	2/2	1/1	2/2	10/10	10 / 10	10 / 10	10 / 10	2	6.51/3.38	3/3	
ESTS-D	Water Repellent Oil Stain S/T redwood #704	< 350 s/b	Over-night	Over-night	Over-night	3	N/A	9.5 / 14.2	2/2	1/1	2/2	10/10	8 / 10	8 / 10	9 / 7	3	5.68/2.4	3/3	

[1] Waterborne. [2] Solvent-based. [3] Duplicates [4] No cracking or peeling observed during the time period. [5] Moisture resistance was combined with UV resistance test.
*a, *d – refer to Summary of Non-standard Test Methods. * – No-VOC coating

Category A4.2 – Interior Semi Transparent Stains (ISTS)

Manufacturer	Trade name	Reported V.O.C. / (g/l), type	ASTM D1640				Grain raising* Amount Wood Smooth (0 - 5, 5-best) cedar	ASTM D2243 Freeze-Thaw Resistance- (0-5, 5-best) cycles	Finish (oak/maple)	Grain definition (oak/maple)	Application method
			Dry times on sealed charts at 3 mils wet film	ASTM D1640	ASTM D1640	ASTM D1640					
Set to touch	Tack free	Dry through	Dry hard	Amount Wood Smooth	Resistance- cycles	Grain raising*	ASTM D2243 Freeze-Thaw Resistance- (0-5, 5-best) cycles	Finish (oak/maple)	Grain definition (oak/maple)	Application method	
ISTS-A	WST-5	0 w/b ^[1]	10 min	10 min	40 min	4	4	Reddish brown/ Reddish brown	Good grain definition/ Good grain definition	Wiping / Wiping	
ISTS-B	Wood Finish Special Walnut # 224	485 s/b	6 hr	7 hr	8 hr	4	N/A ^[2]	Dark brown/ Dark brown	Very good grain definition/ Very good grain definition, some blotchiness	Wiping / Wiping	
ISTS-C	Decolac II lacquer stain LQ 122 FRENCH PEARL	< 720 s/b	15 min	21 min	26 min	4	N/A ^[2]	Light brown with white accents/ Light brown with white accents	Less definition/ Less definition	Spray/ spray	
ISTS-D	Diamond Wood Stain Special Walnut	300 w/b	45 min	1 hr	3 hr	4	5	Brown/Light brown	Very good grain definition/ Good grain definition	Wiping / Wiping	
ISTS-E	Stainseal II wiping oil stain walnut	< 550 s/b ^[2]	6 hr	7 hr	8 hr	5	N/A ^[2]	Yellowish brown/ Yellowish brown	Very good grain definition/ Very good grain definition	Wiping / Wiping	

[1] Waterborne [2] Solvent-based *a – refer to Summary of Non-Standard Test Methods * – No-VOC coating

Category A5- Sanding Sealers (SS)

Manufacturer	Trade name	Reported V.O.C. / (g/l)	Re-coat time label claim	ASTM D1640 Dry times on sealed charts at 3 mils wet film				Grain raising ^a Amount (Wood-Oak) (0 - 5, 5-best)	ASTM D2243 Freeze-Thaw Resistance- cycles (0-5, 5-best)	Color change ASTM D2244 (unit ΔC/E, 0-best)	Flow	Sanding ASTM G53-88 Appearance	ASTM D1211 Hot/cold check (cycles)	Sprayability		Sag (3-12 mils, 12-best)	
				Set to touch	Tack free	Dry through	Dry hard							Rating	Equipment		
SS-A*	WSS-9D	0 w/b ^[1]	1 hr	30 min	50 min	1 hr	1 hr	3	5	4.43	Excellent	Okay	Some loading	N/A	Very good	Cup gun Binks #2001	<3 mils
SS-B	Wood Classic FastDry B26V43	522 g/b ^[2]	1 hr	25 min	35 min	45 min	45 min	4	N/A	9.86	Excellent	Best	Easy powder	N/A	Very good	HVLP Binks BBR	3 mils
SS-C	550 Crystaclear Lacquer sanding sealer LQ 150-0	< 550 g/b	45 min	15 min	15 min	20 min	20 min	3	N/A	4.92	Excellent	Good sanding	Lots of passes for 1 mil dry	N/A	Very Good	HVLP Binks BBR	6 mils
SS-D	Pro Finisher Waterborne	< 350 w/b	2 hr-w/b 12 hr-s/b	30 min	1 hr	1 hr	1.5 hr	3	5	6.93	Excellent	Good sanding	Slight loading	N/A	Very Good	Cup gun Binks #2001	<3 mils

[1] Waterborne [2] Solvent-based. * - No-VOC coating

^a - refer to Summary of Non-standard Test Methods.

Category A6- Waterproofing Sealer (WS)

Manufacturer	Trade name	Reported V.O.C. / (g/l), type	Wood and Concrete		Wood		Concrete		
			ASTM D2243 Resistance- Thaw cycles	ASTM D1653 Moisture vapor transmission (0-500, 0-best)	ASTM D5401 Water repellent efficiency (%) (0 - 100, 100- best) ^[1]	ASTM D4466 Swell(%) (0 - 100, 0-best)	Water uptake(%) ^(0 - 100, 0-best)	Reading ^[3] (0 - 5, 5-best)	Coating penetration Sahillio (unit 1/1000 inch, 1-best)
WS-A*	WPS-2	0 w/b ^[1]	0	38.8	87.4	0.42	1.85	> 4 hr	5
WS-B	Waterproofing sealer	< 8 w/b	1	352.63	49.2	0.74	2.4	> 4 hr	24
WS-C	Waterseal Ultra waterproofer	< 400 w/b	0	372.00	49.5	0.29	3.39	3 min	18
WS-D	#92 NWF WATERPROOFING Clear	< 350 g/b ^[2]	N/A	32.43	72.0	0.19	0.91	> 4 hr	45

[1] Waterborne [2] Solvent-based. [3] Time for five drops of water per bead without wetting the surface.

* - No-VOC coating

Category A7- System 1 (S1)

Manufacturer	Stain / Sanding Sealer / Varnish - 2 coats	ASTM D2197 Mar Resistance(grams) (higher is better)	ASTM D1212 Wet film thickness(mils)	ASTM D2244-73 Color Change			ASTMD1308 Household Chemical Resistance (0-5, 5-best)							ASTM D3359 adhesion oak(0B-5B, 5B-best)	ASTM D3359 adhesion maple(0B-5B, 5B-best)	ASTM D2091-88 Print resistance oak	ASTM D2091-88 Print resistance maple	Appearance [2]				
				L*(oak/maple)[1]	a*(oak/maple)[1]	b*(oak/maple)[1]	D.I water 16 hrs covered	Windex amm- d 1hr cvt	Espresso 1 hour covered	French's mustard 1 hour	Vodka 80 proof 1 hour cvrd	Axle grease 1 hour	Motor oil 1 hour					Depth	Orange Peel	ASTM D523-89 60 deg. Gloss oak	ASTM D523-89 60 deg. Gloss maple	
S1-A	WST-5 / WSS-9D / WTC-99	220	8	50.54/ 56.62	16.25/ 15.47	23.25/ 22.42	5	5	5	4	4	4	4	5	5	5H	5B	No effect	Excellent/ Excellent	No/ No	63	75
S1-B	Wood Finish # 224 / Classic Fast Dry Sanding Sealer / Fast Drying Polyurethane	220	7	49.35/ 45.35	11.85/ 9.61	23.15/ 21.34	5	5	5	2	2	5	5	5	2B	0B	No effect	Excellent/ Excellent	No/ No	84	88	
S1-C	Stainseal III/ Pro Finisher sanding sealer # 13-7163 / Heribloom Varnish	200	9	51.95/ 63.64	15.78/ 10.79	30.06/ 27.56	5	5	5	2	2	5	5	5	2H	5B	No effect	Excellent/ Excellent	No/ No	86	91	
S1-D	Diamond wood stain / Pro Finisher S/S #13-7163 / Mega waterborne finish	180	7	62.15	8.74	21.22	3	1	3	2	2	3	5	5	>5H	5B	No effect	Excellent/ Excellent	No/ No	54	83	

[1] L*, a*, b* are the coordinates descriptive of a color in Hunter Lab color space. This is a refinement of color theory to describe a color by its position in a 3 dimensional color space.

L* is the whiteness index. 0 is black and 100 is pure white. a* is the red-green axis (higher number is more red and lower number is more green). b* is the yellow-blue axis (higher number is more yellow and lower number is more blue).

[2] No grain raising, no flow problems, no blistering, no cracking, no flakiness observed.

*. No-VOC coating

Category A8- System 2 (S2)

Manufacturer	Stain / Sanding Sealer / Lacquer - 2 coats	ASTM D2197 Mar Resistance(grams)	ASTM D1212 Wet film thickness (mils)	ASTM D2244-73 Color			ASTMD1308 Household Chemical Resistance (0-5, 5-best)							ASTM D3359 adhesion oak(0B-5B, 5B-best)	ASTM D3359 adhesion maple(0B-5B, 5B-best)	ASTM D2091-88 Print resistance oak	ASTM D2091-88 Print resistance maple	Appearance [2]				
				L*(oak/maple)[1]	a*(oak/maple)[1]	b*(oak/maple)[1]	D.I water 16 hrs covered	Windex amm- d 1hr cvt	Espresso 1 hour covered	French's mustard 1 hour	Vodka 80 proof 1 hour cvrd	Axle grease 1 hour	Motor oil 1 hour					Depth	Orange Peel	ASTM D523 60 deg. Gloss oak	ASTM D523 60 deg. Gloss maple	
S2-A	WST-5 / WSS-9D / WLQ-6C	200	7	51.18/ 52.67	16.00/ 16.80	21.61/ 21.72	3	1	3	2	2	2	2	5	> 5H	5B	Trace	Excellent/ Excellent	No/ No	56	74	
S2-B	Wood Finish # 224 / Classic Fast Dry Sanding Sealer / Polyurethane Protective Finish	150	7	69.25/ 62.34	6.48/ 8.59	20.77/ 23.54	5	5	5	2	2	5	5	5	F	4B	Trace	Excellent/ Excellent	No/ No	67	77	
S3-C	Decolac II lacquer stain #LQ122 / 550 Crystalclear LQ 153-0	470	8	55.93/ 55.19	11.02/ 13.22	17.61/ 20.83	5	5	5	2	2	5	5	>5H	5B	Trace	Trace	Good	Yes	Yes	47	67
S4-D	Diamond wood stain / Pro Finisher S/S # 13-7163 / AQUAZAR waterborne urethane	180	7	51.73/ 54.72	10.77/ 11.64	19.82/ 19.98	3	1	3	2	2	3	5	> 5H	5B	None	None	Excellent/ Excellent	No/ No	47	68	

[1] L*, a*, b* are the coordinates descriptive of a color in Hunter Lab color space. This is a refinement of color theory to describe a color by its position in a 3 dimensional color space.

L* is the whiteness index. 0 is black and 100 is pure white. a* is the red-green axis (higher number is more red and lower number is more green). b* is the yellow-blue axis (higher number is more yellow and lower number is more blue).

[2] No grain raising, no flow problems, no blistering, no cracking, no flakiness observed.

*. No-VOC coating

Category A9- System 3 (S3)

Manufacturer	Stain / Sanding Sealer / Lacquer - 3 coats	ASTM D2197 Mar Resistance(grams)	ASTM D1212 Wet film thickness(mils)	ASTM D2244-73 Color Change			ASTMD1308 Household Chemical Resistance (0-5, 5-best)							Appearance [2]									
				L*(oak/maple)[1]	a*(oak/maple)[1]	b*(oak/maple)[1]	D1 water 16 hrs covered	Windex amm- d 1hr covered	Espresso 1 hour covered	French's mustard 1 hour	Vodka 80 proof 1 hour cvrd	Axle grease 1 hour	Motor oil 1 hour	ASTM 3363 Pencil hardness oak (5B-5H, 5H-best)	ASTM 3363 Pencil hardness maple (5B-5H, 5H-best)	ASTM D3359 adhesion oak(0B-5B, 5B-best)	ASTM D3359 adhesion maple(0B-5B, 5B-best)	ASTM D2091-88 Pmt resistance oak	ASTM D2091-88 Pmt resistance maple	Depth Oak/ Maple	Orange Peel	ASTM D523 60 deg. Gloss oak	ASTM D523 60 deg. Gloss maple
S3-A	WST-5 /WSS-9D / WLQ-6C	200	9	47.29/ 53.3	16.08/ 16.82	18.96/ 22.31	3	1	3	2	2	2	5	5	> 5H	5B	5B	None	None	Excellent/ Excellent	No/ No	64	74
S3-B	Wood Finish# 224 / Classic FastDry Sanding Sealer / Polyuretic Protective Finish	150	9	51.64/ 52.97	10.32/ 10.26	19.37/ 22.96	2	2	3	2	3	5	5	5	HB	4B	0B	None	Trace	Excellent/ Excellent	No/ No	71	80
S3-C	Decolac II lacquer stain #LQ122 / 550 Crystclear LQ 150-0 Sanding Sealer / 550 Crystclear LQ 153-0	270	10	56.89/ 60.33	11.87/ 10.78	18.7/ 18.22	5	1	3	2	2	5	5	5	4H	5B	5B	None	None	Good Good	Yes/ Yes	78	76
S3-D	Diamond wood stain / Pro Finisher S/S # 13-7163 / AQUAZAR waterborne urethane	180	9	51.67/ 60.62	11.42/ 9.58	21.71/ 20.71	3	5	3	5	2	3	5	> 5H	> 5H	5B	5B	None	None	Excellent/ Excellent	No/ No	71	61

[1] L*, a*, b* are the coordinates descriptive of a color in Hunter Lab color space. This is a refinement of color theory to describe a color by its position in a 3 dimensional color space.

L* is the whiteness index. 0 is black and 100 is pure white. a* is the red-green axis (higher number is more red and lower number is more green). b* is the yellow-blue axis (higher number is more yellow and lower number is more blue).

[2] No grain raising, no flow problems, no blistering, no cracking, no flaking observed.

*. No-VOC coating

Summary of Non-standard Test Methods

Grain raising: Grain raising is a result of how wet the substrate becomes and how much coating is applied to the raw substrate.

Coating penetration: The panels that were coated for the respective test were cut. The cut was stained with a mixture of blue food color and water. The films do not absorb the color and this non-stained layer was measured with an optical microscope with a measuring reticule. The best definition of the layer occurs if the stain is applied while viewing the cross-section under the microscope. The penetration is expressed as divisions of the scale in the reticule. The penetration on the 2"x4" boards used for the water repellent efficiency test was looked at using this method. The results were to inconsistent to recommend these results or this method on these boards.

Stain blocking: Coated redwood panels were placed in a humidity chamber maintained at 100°F and a minimum 95% Relative Humidity (saturation) for four (4) weeks. A visual evaluation of the staining coming through the coatings from the substrate was performed.

Dirt Pick-Up: Carbon black was rubbed into the coated wood surface using moderate thumb pressure. The coating was then washed with a sponge and clean water, again using moderate pressure. Panels were evaluated after air drying.

Hot/cold check: These tests were run on panels of coatings that were dried for 3 weeks. The wood was a 3/8" birch cabinet grade plywood, 5 ply, all cut from the same sheet. No filler was used, films were applied by spray with their respective methods. The panels were prepared in duplicates. The cold box used was a refrigerator aided by dry ice to drop the temperature to sub zero. The average temperature on the cold cycle was -11°F to -2°F. The film thickness in mils were WTC-99 6 mils; WLQ-9C 7 mils; AQUAZAR 7 mils; BonaKemi MEGA 8 mils; D.E. LQ 153-0-9-10 mils; Minwax Polyuretic 7 mils; Herloom Varnish 12 mils; Minwax Polyurethane 10 mils.

Mar resistance: This was performed using a loaded beam apparatus with a #13 steel yarn needle as marking tool. Here the tool is held at a 45° angle to surface, and the beam is loaded with weight until a permanent mark is made when moving across the surface of the panels. For this measurement, the system 2 and 3 films over maple were used as panels. The films had dried 4 weeks and the marks were made cross-grain.

Sandibility: Rating on how panels sanded with 150 grit sandpaper. The ratings noted; how quickly the films were leveled, sanding powder formed, filling of the grit of the sandpaper, and potential for gumming of the sandpaper. Both hand mechanical sanding was done.

Saltillo tiles: The 12"x12" tiles were selected for uniformity with set. The dust was brushed off the top surface and the water repellent applied with a brush until the tile would accept no more and a wet film of repellent was on the surface for more than one minute. The amount of repellent used was determined by weight applied. Dividing the amount used on the square foot tile by the weight per gallon gives the actual usage rate.

Moisture Vapor Transmission per ASTM D1653 (modified): Testing was performed on Whatman No. 4 Filter Papers impregnated with each of the coatings. Samples were tested after air drying for 1 week and conditioning to constant weight. Testing was performed on Whatman No. 4 Filter Papers impregnated with 6g (wet) of each of the coatings. Controls were impregnated with water. A second set of samples were prepared for Coating B using just 3g of wet material. These were used in the testing as the original samples did not "dry" within the time frame for the test. Samples were tested after air drying for 1 week and conditioning to constant weight.

Appendix C

Photographs from Repair Tests



S1 A Original



S1 A Damaged



S1 A Repaired



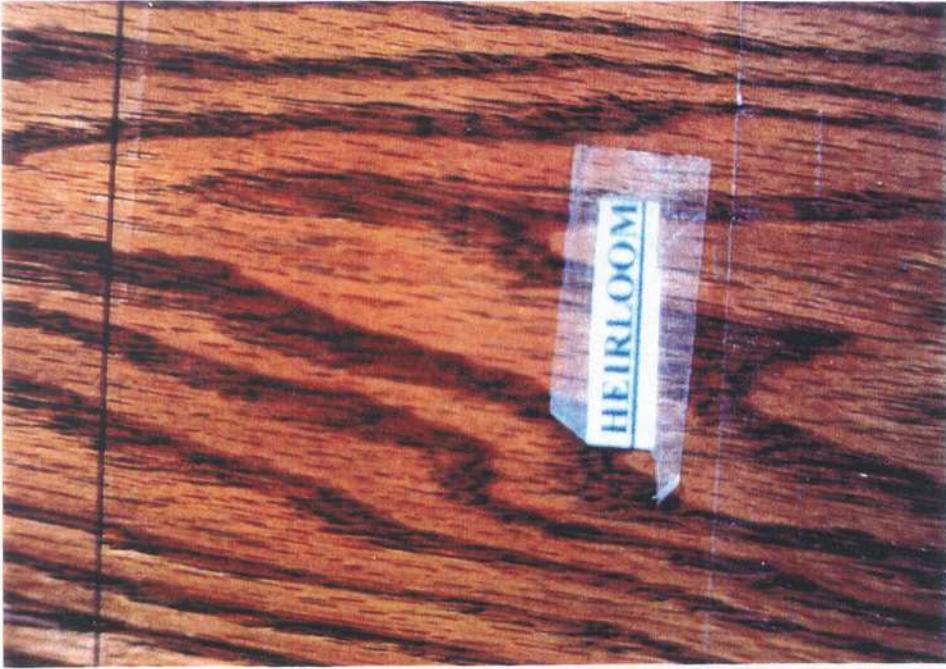
S1 B Original



S1 B Damaged



S1 B Repaired



1 C Orig



C D imaged



C Repa red



S1 D Original



S1 D Damaged



S1 D Repaired



S2 A Original



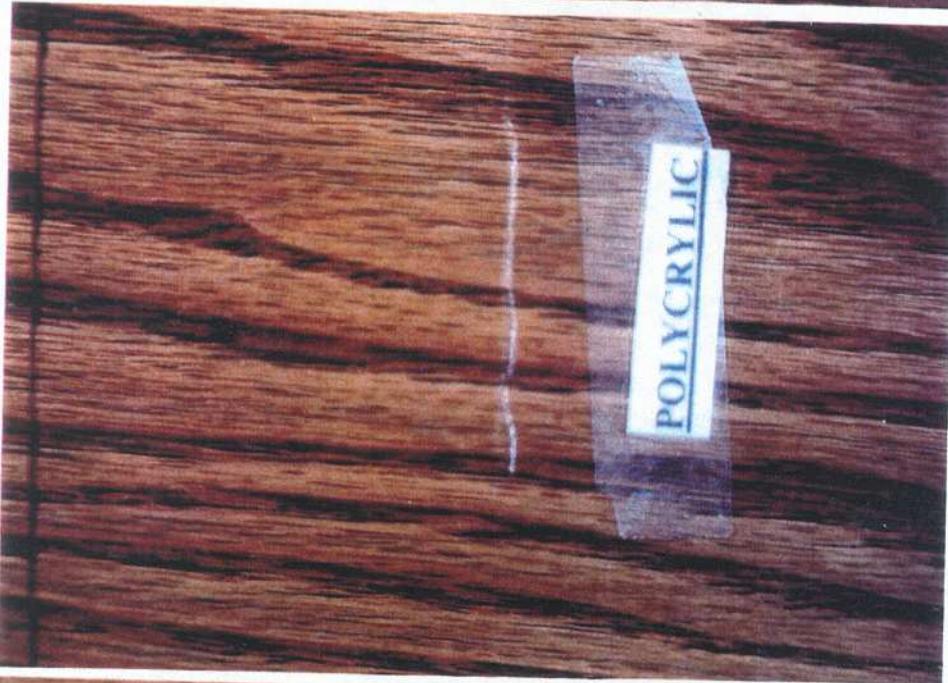
S2 A Damaged



S2 A Repaired



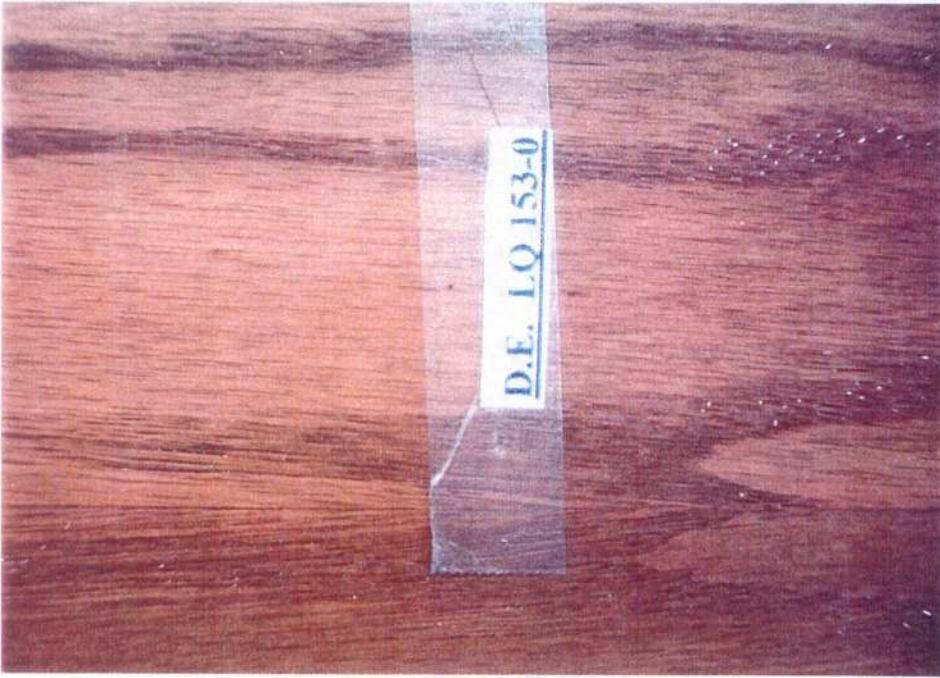
S2 B Original



S2 B Damaged



S2 B Repaired



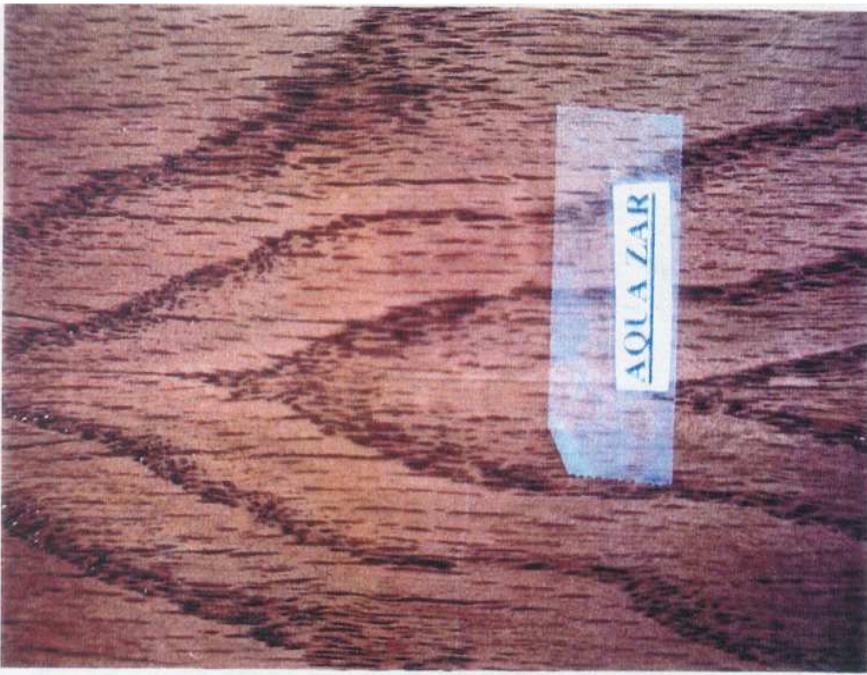
S2 C Original



S2 C Damaged



S2 C Repaired



S2 - D Original



S2 - D Damaged



S2 - D Repaired

Appendix D

Field Demonstration Forms

South Coast Air Quality Management District Field Demonstration

Product Performance Form

12/13/00

Present: Rich Hosman, Jeff Wong, Guillermo Garcia

Name: Commercial Casework

System Description (Resin type, etc.): Sanding Sealer, Acrylic

Lacquer, Urethane

Background (To do this job, what type (brand) of product would you typically use?:
AMT Sealer, AMT Lacquer, AMT "A" Series Stain - All individually 450 g/L VOC, solvent-
based with exempt solvents.

Facility Description: At a woodworking and coating facility. Typical output includes:
conference tables, book cases, and other architectural pieces. Facility has an overhead
heater at about 18 feet above the finished floor in the coating area.

Job Description: Demonstration - Stain - Sanding Sealer + Lacquer

Time of Day: 10:00 AM Start: 10:00AM Finish: 11:45AM

Temperature: 72°F Humidity: 50% Dew Point: _____

Weather: Clear Cloudy Overcast Rain

Surface Description: Interior Exterior New
 Previously Painted

Area, Square Feet: 2 – 3' X 3' oak laminate panels

Substrate Construction: Plaster Wallboard Wood
 Metal Stucco Other Textured

Surface Preparation: Primed Sanded Washed
 Other Sand-blasted

Sanded with 120-grit paper and blew off dust.

Paint Application Method

Application Data

Brush Type: _____ Roller Type: _____

Spray Equipment Airless HVLP Conventional

Tip Size, Filter Size: Number 66

Was Product Thinned?: Yes How much _____
 No

Wet Film Thickness: Two wet coats, 5-6 mils thick, measured using a wet comb.

Describe Application Technique (e.g. cut-in, spray and back-rolled, etc.):

Spray – Excellent spray characteristics, no plugging, applied evenly for topcoat and sanding sealer

Product Evaluation

Spray: Does the paint work well, easily controlled? Yes No

Does the tip clog? Yes No

Performance Data for Sanding Sealer

Rate product performance using provided scale

	Excellent	Very Good	Good	Fair	Poor
<input type="checkbox"/> Dry Time – Dry to Touch	1- <input checked="" type="checkbox"/>	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>
<input type="checkbox"/> Dry Time – Recoat Time	1- <input checked="" type="checkbox"/>	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>
<input type="checkbox"/> Flow and Leveling	1- <input checked="" type="checkbox"/>	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>
<input type="checkbox"/> Sanding Properties	1- <input type="checkbox"/>	2- <input type="checkbox"/>	3- <input checked="" type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>

Comments: Sanding sealer dried in 7 minutes, sanded with 280-grit sandpaper. Sands very easily - About the same as solvent sanding sealer.

Performance Data for Lacquer 1st Coat

Rate product performance using provided scale

	Excellent	Very Good	Good	Fair	Poor
<input type="checkbox"/> Dry Time – Dry to Touch	1- <input checked="" type="checkbox"/>	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>
<input type="checkbox"/> Dry Time – Recoat Time	1- <input checked="" type="checkbox"/>	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>
<input type="checkbox"/> Flow and Leveling	1- <input type="checkbox"/>	2- <input type="checkbox"/>	3- <input checked="" type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>
<input type="checkbox"/> Touch Up Ability	1- <input checked="" type="checkbox"/>	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>

Comments: 1st Coat – 10:30AM – Dried at 10:42AM – Orange peel

Performance Data for Lacquer 2nd Coat

Rate product performance using provided scale

	Excellent	Very Good	Good	Fair	Poor
<input type="checkbox"/> Dry Time – Dry to Touch	1- <input checked="" type="checkbox"/>	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>
<input type="checkbox"/> Dry Time – Recoat Time	1- <input checked="" type="checkbox"/>	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>
<input type="checkbox"/> Flow and Leveling	1- <input type="checkbox"/>	2- <input checked="" type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>
<input type="checkbox"/> Touch Up Ability	1- <input checked="" type="checkbox"/>	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>

Comments: 2nd Coat – 10:47AM – Dried at 11:00AM – Orange peel

Performance Data for Lacquer 3rd Coat – ½ Panel

Rate product performance using provided scale

	Excellent	Very Good	Good	Fair	Poor
<input type="checkbox"/> Dry Time – Dry to Touch	1- <input checked="" type="checkbox"/>	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>
<input type="checkbox"/> Dry Time – Recoat Time	1- <input checked="" type="checkbox"/>	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>
<input type="checkbox"/> Flow and Leveling	1- <input type="checkbox"/>	2- <input checked="" type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>
<input type="checkbox"/> Touch Up Ability	1- <input type="checkbox"/>	2- <input checked="" type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>

Comments: 3rd Coat – 12 Minutes dry time – Flow and leveling properties improved -
Depth improved.

Performance Data for Lacquer 4th Coat – ½ Panel

Rate product performance using provided scale

	Excellent	Very Good	Good	Fair	Poor
<input type="checkbox"/> Dry Time – Dry to Touch	1- <input checked="" type="checkbox"/>	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>
<input type="checkbox"/> Dry Time – Recoat Time	1- <input checked="" type="checkbox"/>	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>
<input type="checkbox"/> Flow and Leveling	1- <input type="checkbox"/>	2- <input checked="" type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>
<input type="checkbox"/> Touch Up Ability	1- <input checked="" type="checkbox"/>	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>

Comments: 4th Coat – 12 Minutes dry time – 85° Gloss.

Uniformity (compare the firm's uniformity, with respect to (primer/flat) hat banding, flashing, touch-up (eggshell/semi gloss) enamel holdout, gloss, sheen.)

Lacquer – As good, or better than any other water based lacquer.

Film Defects (note any mud cracking, cratering, crawling, flashing, pin holing, orange peel, sagging, etc.)

Lacquer – 2nd coat a little orange peel, 3rd coat none.

Overall Product Evaluation

What did you like about this product?

Sanding Sealer – Powdered well, very good, dries fast.

Lacquer – Dries fast.

What don't you like about this product?

Sanding Sealer – Nothing, everything OK.

Lacquer – Flow not as good as solvent, orange peel.

If you could change anything about this product, what would it be?

Sanding Sealer – Nothing.

Lacquer – Better flow, and leveling.

Does this product meet your expectation for these types of uses?

Sanding Sealer – Yes.

Lacquer – Not milky, looks good.

South Coast Air Quality Management District Field Demonstration

Product Performance Form

12/13/00

Present: Rich Hosman, Jeff Wong, Guillermo Garcia

Name: Commercial Casework

System Description (Resin type, etc.): Sanding Sealer, Acrylic

Varnish, Epoxy

Background (To do this job, what type (brand) of product would you typically use?:
AMT Sealer, AMT "A" Series Stain - All individually 450 g/L VOC, solvent-based with
exempt solvents.

Facility Description: At a woodworking and coating facility. Typical output includes:
conference tables, book cases, and other architectural pieces. Facility has an overhead
heater at about 18 feet above the finished floor in the coating area.

Job Description: Demonstration : Stain + Sanding Sealer + Varnish

Time of Day: 10:00 AM Start: 10:00AM Finish: 11:45AM

Temperature: 72°F Humidity: 50% Dew Point:

Weather: Clear Cloudy Overcast Rain

Spraying Environment: Interior Exterior New

Previously Painted

Area, Square Feet: 2 - 3' X 3' oak laminate panels

Substrate Construction: Plaster Wallboard Wood

Metal Stucco Other Textured

Surface Preparation: Primed Sanded Washed

Other Sand-blasted

Sanded with 120-grit paper and blew off dust.

Performance Data for Varnish 1st Coat

Rate product performance using provided scale

	Excellent	Very Good	Good	Fair	Poor
<input type="checkbox"/> Dry Time – Dry to Touch	1- ☒	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>
<input type="checkbox"/> Dry Time – Recoat Time	1- ☒	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>
<input type="checkbox"/> Flow and Leveling	1- ☒	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>
<input type="checkbox"/> Touch Up Ability	1- ☒	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>

Comments: 1st Coat – 10:34AM – Dried at 11:05AM – Initial milky appearance.

Performance Data for Varnish 2nd Coat

Rate product performance using provided scale

	Excellent	Very Good	Good	Fair	Poor
<input type="checkbox"/> Dry Time – Dry to Touch	1- ☒	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>
<input type="checkbox"/> Dry Time – Recoat Time	1- ☒	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>
<input type="checkbox"/> Flow and Leveling	1- ☒	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>
<input type="checkbox"/> Touch Up Ability	1- ☒	2- <input type="checkbox"/>	3- <input type="checkbox"/>	4- <input type="checkbox"/>	5- <input type="checkbox"/>

Comments: 2nd – 11:06AM – Dried at 11:21AM – Initially milky appearance – After drying
Appeared good – But still a little milky - Yellowness

Uniformity (compare the firm's uniformity, with respect to (primer/flat) hat banding, flashing, touch-up (eggshell/semi gloss) enamel holdout, gloss, sheen.)

Varnish 1st Coat

Film Defects (note any mud cracking, cratering, crawling, flashing, pin holing, orange peel, sagging, etc.)

Varnish 2nd – Little milky and yellow.

Overall Product Evaluation

What did you like about this product?

Sanding Sealer – Powdered well, very good, dries fast.

Varnish – Durable, looks good, slightly milky.

What don't you like about this product?

Sanding Sealer – Nothing, everything OK.

Varnish – Don't know durability, milky, and slightly yellow .

If you could change anything about this product, what would it be?

Sanding Sealer – Nothing.

Varnish – Better flow, get rid of milky appearance.

Does this product meet your expectation for these types of uses?

Sanding Sealer – Yes.

Varnish – Little milky

Appendix E

Coating Product Data Sheet

Product Information Sheet

Product: Lacquer WLC-6C

Purpose: High quality, high clarity, single component wood topcoat. This topcoat has Zero VOCs and very low odor. This a waterbased product with a extremely low flammability. It has good resistance to household chemicals and gives a mar resistant, abrasion resistant gloss finish.

Weight per gallon: 8.60

Nonvolatile: 30%

Dry Times: Dry to handle in 1 hour. Dry to recoat in 2 hours.

Surface preparation: On bare wood, the wood shall be clean, dry, and free of all contaminants. Sand smooth to a uniform surface with 120 grit sandpaper or better. Do not use steel wool. Remove all dust.

On stains: be sure the stain is fully cured. The surface should be clean and dry.

Over sanding sealers or 2nd coat of a self-sealing system: Sand lightly with 220 grit or finer sandpaper and remove dust.

Application: Stir thoroughly- do not shake. The lacquer may be applied by conventional air gun, HVLP gun or airless spray (0.017 or 0.015 tip), or good quality nylon- polyester brush. Apply at three mils wet per coat. A minimum of three coats on a self-sealing system over bare wood or two coats over a sealer or a stain are needed for appearance and durability. The lacquer may be recoated 2 hours after application under standard drying conditions of 70°F and 50% relative humidity. If several days have passed between coats, a light sanding with 220 grit sandpaper will insure the adhesion of subsequent coats.

The finish maybe touched up by a light sanding with 220 grit or finer sandpaper after the topcoat has dried overnight.

If you have a extreme grain raise situation, apply two coats of the lacquer and let fully dry overnight and sand with 220 grit sandpaper. Remove the dust and apply two more coats of lacquer.

Coverage: 350–400 sq. ft/ gal

Thinning is not recommended

Clean up with soap and water

Gloss potential 75-80 @ 60° over wood.

Protect from Freezing

MATERIAL SAFETY DATA SHEET

PRODUCT: Adhesive Coatings Lacquer WLC-6C

PART 1 - GENERAL INFORMATION

Manufacturer: Adhesive Coatings 2471 Peralta Street Oakland, CA 94607 (510) 451-2470	NPCA HMIS Rating Health: 1 Flammability: 0 Reactivity: 0 Personal Protection: D
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Emergency Numbers: 1-800-424-9300 (Chemtrec)

Chemical Family:	Latex Paint
Generic Name:	Water Based Paint
DOT Proper Shipping Name:	Water Based Paint, n.o.s.
DOT Hazard Class:	Not Regulated
Revision: 3 Date: 3/16/01	

PART 2 - Ingredients

Ingredient Name	CAS #	%weight	OSHA(pel)	ACGIH(tlv)
Acrylic Co-polymer	25987-66-0	10-50	n/a	n/a

PART 3 - PHYSICAL AND CHEMICAL DATA

VOC of Material: 0 grams/liter and 0 #/gal	Boiling Point: 100°C
VOC excluding water: 0 grams/liter and 0 #/gal	pH: 7.5 - 9
Volatile portion: 55-85 % wt	Freezing Point: 0°C
Specific Gravity: 1.0-1.3 @20°C	Viscosity: 50-75 KU
Solubility in water: Dilutable	Vapor Pressure: Negligible
Appearance and Odor: Thick White Liquid / mild odor	
Conditions and materials to avoid: High temperatures, oxidizing conditions.	
Hazardous decomposition products: Acrid smoke, fumes, carbon monoxide/dioxide may be released upon decomposition.	

PART 4 - FIRE AND EXPLOSION

Flash Point: > 250°C (Method: ISO 3679)
Autoignition temperature: N/DA
Flammable limits (%volume in air) Lower: N/DA Upper: N/DA
Fire and explosion hazards: Not-flammable
Extinguishing media: Dry chemical, CO₂, Water spray, Foam, Water fog.
Special fire-fighting procedures: Do not enter fire area without special protection. Fight fire from safe distance or protected location. Heat or impurities may increase temperature, build pressure, rupture closed containers spreading fire and increase the risk of burns and injuries. Use water spray/fog for cooling. Notify authorities if liquid enters sewer or public waters.

PART 5 - EMERGENCY AND FIRST AID

Inhalation: If overcome by exposure, remove victim to fresh air immediately. Give oxygen or artificial respiration as needed. Obtain emergency medical attention, prompt action is essential.

Eye Contact: In case of eye contact, immediately flush eyes with clean water for 20 - 30 minutes. Retract eyelids often. Obtain emergency medical attention if pain, blinking, tears, or redness persist.

Skin Contact: Remove contaminated clothing as needed. Wash skin thoroughly with mild soap and water. Flush with lukewarm water for 15 minutes. If sticky, use waterless hand cleaner first.

Ingestion: If large quantity is swallowed, give lukewarm water (1 pint) if victim is completely conscious and alert. Do not induce vomiting, risk of damage to lungs exceeds poisoning risk. Obtain emergency medical attention.

Emergency Medical Treatment: Treat symptomatically.

PART 6 - EFFECTS OF EXPOSURE

Routes of exposure:

Inhalation: This material is not expected to present an inhalation hazard at standard conditions due to its low volatility. However, overexposure to mists/aerosols may cause respiratory tract irritation such as coughing, shortness of breath, and mucus production.

Eye Contact: Potential route. May cause eye irritation. Symptoms may include tearing, blinking, redness and swelling.

Skin absorption: Potential route. Although no data was found for this product, the potential for skin absorption does exist.

Skin Irritation: Potential route. May produce skin irritation. May cause an allergic skin reaction in some individuals after repeated skin contact.

Ingestion: This material may be a health hazard if ingested in large quantities.

Medical conditions aggravated by exposure: No additional medical information found.

PART 7 - PROTECTIVE EQUIPMENT AND CONTROL MEASURES

Respiratory Protection: If this material is handled under mist forming conditions, use NIOSH/MSHA approved respiratory protection equipment.

Eye Protection: Eye protection such as chemical splash goggles and/or face shield must be worn when possibility exists for eye contact due to splashing or spraying, liquid, airborne particles, or vapor. Contact lenses should not be worn.

Skin Protection: Depending on the conditions for use, protective gloves, apron, boots, head, and face protection should be worn. This equipment should be cleaned after each use.

Engineering Controls: If handling results in mist or aerosol or vapor generation, local exhaust ventilation is recommended.

Other Hygienic Practices: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Other Work Practices: Use good personal hygiene. Wash hands before eating, drinking, smoking, or using the toilet facilities. Promptly remove soiled clothing and wash thoroughly before reuse. Shower after work using plenty of soap and water.

PART 8 - REACTIVITY DATA

Stability: Stable

Incompatibility: Strong bases and acids.

Hazardous polymerization: Will not occur.

Hazardous decomposition: Will not occur.

PART 9 - SPILL OR LEAK PROCEDURES

Avoid all personal contact. Take up with absorbent material. Scoop and vacuum up, place in closed container for disposal. Avoid dusting. Flush contaminated area with water. Dispose in accordance with federal, state, and local regulations.

PART 10 - STORAGE AND SPECIAL PRECAUTIONS

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

Practice caution and personal cleanliness to avoid skin and eye contact. Avoid breathing vapors of heated material.

PART 11 - REGULATORY INFORMATION

TRANSPORTATION

Not Regulated

PART 12 - LABEL INFORMATION

FOR INDUSTRIAL USE ONLY!! Skin contact hazard. Eye and skin irritant.

May cause allergic reaction. Avoid contact with eyes, skin, and clothing. Do not breath vapors or mist. Wash thoroughly after handling.

Do not swallow. Prevent contact with food, chewing or smoking materials.

FIRST AID

EYES: Immediately flush with plenty of clean water

INHALATION: Remove to fresh air if effects occur. Consult a physician.

SKIN CONTACT: Wash thoroughly with mild soap and flowing water or shower.

INGESTION: Give fluids. Call a physician.

NOTE TO PHYSICIAN: No specific antidote. Supportive care. Treatment based on judgment of physician in response to reaction of the patient.

Some of the information presented and conclusions drawn herein are from sources other than direct test data on the product itself. The information in this MSDS was obtained from sources which we believe are reliable. However, the information is provided without any warranty, express or implied, regarding its correctness. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage, or expense arising out of or in any way connected with the handling, storage, use, or disposal of the product. This MSDS was prepared and is to be used only for this product. If the product is used as a component in another product, this MSDS information may not be applicable. This MSDS has been prepared in accordance with the requirements of the OSHA Hazard Communication Standard (29 CFR 1200).

Product Information Sheet

Product: Gloss Wood Varnish Catalyzed WTC-99

This clear gloss is a high performance epoxy coating suitable for application on furniture, cabinets, flat stock, molding, paneling and other wood applications. This two- component water-based product is a hard, durable, chemical and stain resistant interior wood coating that contains no organic solvents. It is designed to be applied directly over wood stains, sealers or bare wood. Because it cures by a chemical reaction, it has success over oily woods and over woods with high natural acids. It can be applied easily by conventional spray systems or brush

Color: Clear
 Finish: Gloss
 Pot Life: 4 hours
 Clean Up: Warm, soapy water
 Density: 9.0#/gal (Mixed system)
 Volume Solids: 30%
 Weight Solids: 35%
 Shelf Life: > 1 year
 Flash Point: > 350 °F
 Dry Time: @ 77°F/50%R.H., 3 mil wet film
 To touch: 30 minutes
 To recoat: 1 hour
 To handle: approx. 2-4 hours
 Viscosity: approx. 75 KUs
 Usage (by volume): Part A Part B
 2 1
 Induction Time: None
 Intercoat Adhesion: Excellent
 Thinner: Water

Pencil Hardness: 2H
 Abrasion Resistance: excellent
 Mar Resistance: excellent
 Chemical Resistance:
 Water
 Cleaners and Detergents
 Foods and Beverages
 Mild Acids and Bases
 Alcohols

Theoretical Coverage:
 1 mil (dry) / 2 mil (wet): 475 square feet
 2 mil (dry) / 4 mil (wet): 238 sq. ft.
 3 mil (dry) / 6 mil (wet): 158 sq. ft.

Hot /Cold Check passes 6 cycles

Surface preparation: On bare wood, the wood shall be clean, dry, and free of all contaminants. Sand smooth to a uniform surface with 120-grit sandpaper or better. Do not use steel wool. Remove all dust.

On stains: be sure the stain is fully cured. The surface should be clean and dry.

Over sanding sealers or 2nd coat of a self-sealing system: Sand lightly with 220 grit Or finer sandpaper and remove dust.

Application: Stir thoroughly- does not shake.

The mix ratio is 2 parts of B to one part of A. While stirring part A, slowly add part B, and continue mixing for 3-4 minutes.

The useable life of this varnish is 4 hours from the time of mixing. You cannot re-catalyze the unapplied coating.

Application continued-

The varnish may be applied by conventional air gun, HVLP gun or airless spray (0.017 or 0.015 tip), or good quality nylon- polyester brush. Apply at three mils wet per coat. A minimum of three coats on a self-sealing system over bare wood or two coats over a sealer or a stain are needed for appearance and durability. The varnish may be recoated 2 hours after application under standard drying conditions of 70°F and 50% relative humidity.

The cured finish maybe touched up with fresh varnish by a light sanding with 220 grit or finer sandpaper and reapplying.

If you have an extreme grain raise situation, apply two coats of the varnish and let fully dry overnight and sand with 220 grit sandpaper. Remove the dust and apply one more coat of varnish.

Coverage: 350 –400 sq. ft/ gal

Thinning is not recommended

Clean up with soap and water while varnish is wet. The cured product is very difficult to remove from brushes or guns.

Gloss potential 70-80 @ 60° over wood.

Protect form Freezing

MATERIAL SAFETY DATA SHEET

PRODUCT: Adhesive Coatings Catalyzed varnish WTC-99 Part A

PART 1 - GENERAL INFORMATION

Manufacturer: Adhesive Coatings 2471 PERALTA Street Oakland, CA 94607 (510) 451-2326	NPCA HMIS Rating Flammability: 0 Health: 1 Reactivity: 0 Personal Protection: D
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Emergency Numbers: 1-800-424-9300 (Chemtrec)

Chemical Family:	Latex Paint
Generic Name:	Water Based Epoxy Paint
DOT Proper Shipping Name:	Water Based Paint, n.o.s.
DOT Hazard Class:	Not Regulated
Revision: 7	Date: 2/13/01

PART 2 - Ingredients

Ingredient Name	CAS #	%weight	OSHA(PEL)	ACGIH(TLV)
Epoxy Polymer	025085-99-8	35-60%	N/A	N/A

PART 3 - PHYSICAL AND CHEMICAL DATA

VOC of Material:	0 grams/liter and 0 #/gal	Boiling Point:	100°C
VOC excluding water:	0 grams/liter and 0 #/gal	pH:	6.0 - 8.0
Volatile portion:	45-50 % wt	Freezing Point:	0°C
Specific Gravity:	1.09 @20°C	Viscosity:	700-1500 cps
Solubility in water:	Dilutable	Vapor Pressure:	Negligible
Appearance and Odor:	Milky White Liquid / mild odor		
Conditions and materials to avoid:	High temperatures, oxidizing conditions.		
Hazardous decomposition products:	Acrid smoke, fumes, carbon monoxide/dioxide may be released upon decomposition.		

PART 4 - FIRE AND EXPLOSION

Flash Point: > 250°C (Method: ISO 3679)
Autoignition temperature: N/A
Flammable limits (%volume in air) Lower: N/A Upper: N/A
Fire and explosion hazards: Not-flammable
Extinguishing media: Dry chemical, CO₂, Water spray, Foam, Water fog.
Special fire-fighting procedures: Do not enter fire area without special protection. Fight fire from safe distance or protected location. Heat or impurities may increase temperature, build pressure, rupture closed containers spreading fire and increase the risk of burns and injuries. Use water spray/fog for cooling. Notify authorities if liquid enters sewer or public waters.

PART 5 - EMERGENCY AND FIRST AID

Inhalation: If overcome by exposure, remove victim to fresh air immediately. Give oxygen or artificial respiration as needed. Obtain emergency medical attention, prompt action is essential.
Eye Contact: In case of eye contact, immediately flush eyes with clean water for 20 - 30 minutes. Retract eyelids often. Obtain emergency medical attention if pain, blinking, tears, or redness persist.
Skin Contact: Remove contaminated clothing as needed. Wash skin thoroughly with mild soap and water. Flush with lukewarm water for 15 minutes. If sticky, use waterless hand cleaner first.
Ingestion: If large quantity is swallowed, give lukewarm water (1 pint) if victim is completely conscious and alert. Do not induce vomiting, risk of damage to lungs exceeds poisoning risk. Obtain emergency medical attention.
Emergency Medical Treatment: Treat symptomatically.

PART 6 - EFFECTS OF EXPOSURE

Routes of exposure:

Inhalation: This material is not expected to present an inhalation hazard at standard conditions due to its low volatility. However, overexposure to mists/aerosols may cause respiratory tract irritation such as coughing, shortness of breath, and mucus production.

Eye Contact: Potential route. May cause eye irritation. Symptoms may include tearing, blinking, redness and swelling.

Skin absorption: Potential route. Although no data was found for this product, the potential for skin absorption does exist.

Skin Irritation: Potential route. May produce skin irritation. May cause an allergic skin reaction in some individuals after repeated skin contact.

Ingestion: This material may be a health hazard if ingested in large quantities.

Medical conditions aggravated by exposure: No additional medical information found.

PART 7 - PROTECTIVE EQUIPMENT AND CONTROL MEASURES

Respiratory Protection: If this material is handled under mist forming conditions, use NIOSH/MSHA approved respiratory protection equipment.

Eye Protection: Eye protection such as chemical splash goggles and/or face shield must be worn when possibility exists for eye contact due to splashing or spraying, liquid, airborne particles, or vapor. Contact lenses should not be worn.

Skin Protection: Depending on the conditions for use, protective gloves, apron, boots, head, and face protection should be worn. This equipment should be cleaned after each use.

Engineering Controls: If handling results in mist or aerosol or vapor generation, local exhaust ventilation is recommended.

Other Hygienic Practices: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Other Work Practices: Use good personal hygiene. Wash hands before eating, drinking, smoking, or using the toilet facilities. Promptly remove soiled clothing and wash thoroughly before reuse. Shower after work using plenty of soap and water.

PART 8 - REACTIVITY DATA

Stability: Stable

Incompatibility: Strong bases and acids.

Hazardous polymerization: Will not occur.

Hazardous decomposition: Will not occur.

PART 9 - SPILL OR LEAK PROCEDURES

Avoid all personal contact. Take up with absorbent material. Scoop and vacuum up, place in closed container for disposal. Avoid dusting. Flush contaminated area with water. Dispose in accordance with federal, state, and local regulations.

PART 10 - STORAGE AND SPECIAL PRECAUTIONS

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

Practice caution and personal cleanliness to avoid skin and eye contact. Avoid breathing vapors of heated material.

PART 11 - REGULATORY INFORMATION

TRANSPORTATION

Not Regulated

PART 12 - LABEL INFORMATION

FOR INDUSTRIAL USE ONLY!! Skin contact hazard. Eye and skin irritant.

May cause allergic reaction. Avoid contact with eyes, skin, and clothing. Do not breath vapors or mist. Wash thoroughly after handling.

Do not swallow. Prevent contact with food, chewing or smoking materials.

FIRST AID

EYES: Immediately flush with plenty of clean water

INHALATION: Remove to fresh air if effects occur. Consult a physician.

SKIN CONTACT: Wash thoroughly with mild soap and flowing water or shower.

INGESTION: Give fluids. Call a physician.

NOTE TO PHYSICIAN: No specific antidote. Supportive care. Treatment based on judgment of physician in response to reaction of the patient.

N/A= not available

Some of the information presented and conclusions drawn herein are from sources other than direct test data on the product itself. The information in this MSDS was obtained from sources which we believe are reliable. However, the information is provided without any warranty, express or implied, regarding its correctness. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage, or expense arising out of or in any way connected with the handling, storage, use, or disposal of the product. This MSDS was prepared and is to be used only for this product. If the product is used as a component in another product, this MSDS information may not be applicable. This MSDS has been prepared in accordance with the requirements of the OSHA Hazard Communication Standard (29 CFR 1200).

MATERIAL SAFETY DATA SHEET

PRODUCT: Adhesive Coatings - Catalyzed varnish WTC-99 Part B

PART 1 - GENERAL INFORMATION

Manufacturer: Adhesive Coatings 2471 Peralta Street Oakland, CA 94607 (510) 451-23326	NPCA HMIS Rating Health: 2 Flammability: 0 Reactivity: 0 Personal Protection: D
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Emergency Numbers: 1-800-424-9300 (Chemtrec)

Chemical Family:	Mixture
Generic Name:	Epoxy Curing Agent,
DOT Proper Shipping Name:	Not Regulated
DOT Hazard Class:	Not Regulated
Revision: 6 Date: 2/13/01	

PART 2 - Ingredients

Ingredient Name	CAS #	%weight	OSHA(pei)	ACGIH(tlv)
Tetraethylenepentamine (polyamine)	112-57-2	<1%	N/A	N/A

PART 3 - PHYSICAL AND CHEMICAL DATA

VOC of Material: 0 grams/liter and 0 #/gal	Boiling Point: 100°C
VOC excluding water: 0 grams/liter and 0 #/gal	pH: 10.0-11.0
Volatile portion: 60-85% wt	Freezing Point: 0°C
Specific Gravity: 1.05-1.5 @20°C	Viscosity: 50-350 cps
Solubility in water: Dilutable	Vapor Pressure: Negligible
Appearance and Odor: Thin translucent liquid / slight odor	
Conditions and materials to avoid: High temperatures, oxidizing conditions.	
Hazardous decomposition products: Acid smoke, fumes, carbon monoxide/dioxide may be released upon decomposition.	

PART 4 - FIRE AND EXPLOSION

Flash Point: > 250°C (Method: ISO 3679)
Auto-ignition temperature: N/DA
Flammable limits (%volume in air) Lower: N/DA Upper: N/DA
Fire and explosion hazards: Not-flammable
Extinguishing media: Dry chemical, CO₂, Water spray, Foam, Water fog.
Special fire-fighting procedures: Do not enter fire area without special protection. Fight fire from safe distance or protected location. Heat or impurities may increase temperature, build pressure, rupture closed containers spreading fire and increase the risk of burns and injuries. Use water spray/fog for cooling. Notify authorities if liquid enters sewer or public waters.

PART 5 - EMERGENCY AND FIRST AID

Inhalation: If overcome by exposure, remove victim to fresh air immediately. Give oxygen or artificial respiration as needed. Obtain emergency medical attention, prompt action is essential.
Eye Contact: In case of eye contact, immediately flush eyes with clean water for 20 - 30 minutes. Retract eyelids often. Obtain emergency medical attention if pain, blinking, tears, or redness persist.
Skin Contact: Remove contaminated clothing as needed. Wash skin thoroughly with mild soap and water. Flush with lukewarm water for 15 minutes. If sticky, use waterless hand cleaner first.
Ingestion: If large quantity is swallowed, give lukewarm water (1 pint) if victim is completely conscious and alert. Do not induce vomiting, risk of damage to lungs exceeds poisoning risk. Obtain emergency medical attention.
Emergency Medical Treatment: Treat symptomatically.

PART 6 - EFFECTS OF EXPOSURE

Routes of exposure:

Inhalation: This material is not expected to present an inhalation hazard at standard conditions due to its low volatility. However, overexposure to mists/aerosols may cause respiratory tract irritation such as coughing, shortness of breath, and mucus production.

Eye Contact: Potential route. May cause eye irritation. Symptoms may include tearing, blinking, redness and swelling.

Skin absorption: Potential route. Although no data was found for this product, the potential for skin absorption does exist.

Skin Irritation: Potential route. May produce skin irritation. May cause an allergic skin reaction in some individuals after repeated skin contact.

Ingestion: This material may be a health hazard if ingested in large quantities.

Medical conditions aggravated by exposure: No additional medical information found.

PART 7 - PROTECTIVE EQUIPMENT AND CONTROL MEASURES

Respiratory Protection: If this material is handled under mist forming conditions, use NIOSH/MSHA approved respiratory protection equipment.

Eye Protection: Eye protection such as chemical splash goggles and/or face shield must be worn when possibility exists for eye contact due to splashing or spraying, liquid, airborne particles, or vapor. Contact lenses should not be worn.

Skin Protection: Depending on the conditions for use, protective gloves, apron, boots, head, and face protection should be worn. This equipment should be cleaned after each use.

Engineering Controls: If handling results in mist or aerosol or vapor generation, local exhaust ventilation is recommended.

Other Hygienic Practices: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Other Work Practices: Use good personal hygiene. Wash hands before eating, drinking, smoking, or using the toilet facilities. Promptly remove soiled clothing and wash thoroughly before reuse. Shower after work using plenty of soap and water.

PART 8 - REACTIVITY DATA

Stability: Stable

Incompatibility: Strong acids.

Hazardous polymerization: Will not occur.

Hazardous decomposition: Will not occur.

PART 9 - SPILL OR LEAK PROCEDURES

Avoid all personal contact. Take up with absorbent material. Scoop and vacuum up, place in closed container for disposal. Avoid dusting. Flush contaminated area with water. Dispose in accordance with federal, state, and local regulations.

PART 10 - STORAGE AND SPECIAL PRECAUTIONS

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

Practice caution and personal cleanliness to avoid skin and eye contact. Avoid breathing vapors of heated material.

PART 11 - REGULATORY INFORMATION

TRANSPORTATION:

DOT Hazard Class: Not Regulated

Proper shipping name: Not Regulated

EPA: N/A California Proposition 65: N/A

PART 12 - LABEL INFORMATION

FOR INDUSTRIAL USE ONLY!! Skin contact hazard. Eye and skin irritant.

May cause allergic reaction. Avoid contact with eyes, skin, and clothing. Do not breath vapors or mist. Wash thoroughly after handling.

Do not swallow. Prevent contact with food, chewing or smoking materials.

FIRST AID

EYES: Immediately flush with plenty of clean water

INHALATION: Remove to fresh air if effects occur. Consult a physician.

SKIN CONTACT: Wash thoroughly with mild soap and flowing water or shower.

INGESTION: Give fluids. Call a physician.

NOTE TO PHYSICIAN: No specific antidote. Supportive care. Treatment based on judgment of physician in response to reaction of the patient.

N/A= not available

Some of the information presented and conclusions drawn herein are from sources other than direct test data on the product itself. The information in this MSDS was obtained from sources which we believe are reliable. However, the information is provided without any warranty, express or implied, regarding its correctness. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage, or expense arising out of or in any way connected with the handling, storage, use, or disposal of the product. This MSDS was prepared and is to be used only for this product. If the product is used as a component in another product, this MSDS information may not be applicable. This MSDS has been prepared in accordance with the requirements of the OSHA Hazard Communication Standard (29 CFR 1200).

ADCO

Product Information Sheet

Product: Exterior Opaque Stain Redwood

**Purpose: Beautify and protect exterior wood surfaces with a Zero VOC product
Fade resistant, all acrylic high quality, high hiding exterior finish**

Weight per gallon: 10.05 pounds per gallon

Nonvolatile : 43 - 44% by weight

Dry Times: 1- 2 hours dry hard, recoat 2 hours

Surface preparation: New wood- Loose wood fibers shall be removed with a stiff bristle brush. All surfaces must be clean and free of all dust, mildew, oil, soot, and other contaminants. Smooth wood and mill glazed wood should be scuff sanded.

Previously painted wood- All surfaces must be clean and free of all dust, mildew, oil, soot, and other contaminants. Wash all surfaces completely with a detergent solution and rinsed thoroughly with clean water. Allow to dry before painting.

If mildew is present, the surface should be treated with a solution of 4 parts water and 1 part household bleach. This should dry on the surface and then the surface should be rinsed with clean water and let dry before painting.

Application – Stir thoroughly. Use a synthetic bristle brush, roller with at least ½” nap, or airless spray using a tip size of 0.017” to 0.021”. On rough woods, the coating should be back brushed while wet to force the coating into all the texture of the wood.

One coat should be sufficient on previously painted surfaces, two coats on new and/or rough sawn woods. Coverage - On rough woods – 150 to 250 square feet , on smooth wood 250 to 400 square feet. Cleanup with soap and water

Precautions:

Do not apply below 50° F, when rain is expected or late in the day when dew will form.

Do not apply in direct sunlight.

Do not allow to freeze

No thinning recommended.

MATERIAL SAFETY DATA SHEET

PRODUCT: Adhesive Coatings Exterior Opaque Stain Redwood

PART 1 - GENERAL INFORMATION

Manufacturer:	NPCA HMIS Rating
Adhesive Coatings	Health: 1
2471 Peralta Street	Flammability: 0
Oakland, CA 94607	Reactivity: 0
(510) 451-2470	Personal Protection: D

Emergency Numbers: 1-800-424-9300 (Chemtrec)

Chemical Family:	Latex Paint
Generic Name:	Water Based Paint
DOT Proper Shipping Name:	Water Based Paint, n.o.s.
DOT Hazard Class:	Not Regulated
Revision: 3 Date: 3/16/01	

PART 2 - Ingredients

Ingredient Name	CAS #	%weight	OSHA(pe)	ACGIH(tlv)
Acrylic Co-polymer	25987-66-0	20-40	n/a	n/a
Zinc Borate	12513-27-8	0.5-5%	n/a	n/a

PART 3 - PHYSICAL AND CHEMICAL DATA

VOC of Material:	0 grams/liter and 0 #/gal	Boiling Point:	100°C
VOC excluding water:	0 grams/liter and 0 #/gal	pH:	7.5 - 9
Volatile portion:	45-75 % wt	Freezing Point:	0°C
Specific Gravity:	1.0-1.3 @20°C	Viscosity:	60-85 KU
Solubility in water:	Dilutable	Vapor Pressure:	Negligible

Appearance and Odor: Thick White Liquid / mild odor
Conditions and materials to avoid: High temperatures, oxidizing conditions.
Hazardous decomposition products: Acrid smoke, fumes, carbon monoxide/dioxide may be released upon decomposition.

PART 4 - FIRE AND EXPLOSION

Flash Point: > 250°C (Method: ISO 3679)
Autoignition temperature: N/DA
Flammable limits (%volume in air) Lower: N/DA Upper: N/DA
Fire and explosion hazards: Not-flammable
Extinguishing media: Dry chemical, CO₂, Water spray, Foam, Water fog.
Special fire-fighting procedures: Do not enter fire area without special protection. Fight fire from safe distance or protected location. Heat or impurities may increase temperature, build pressure, rupture closed containers spreading fire and increase the risk of burns and injuries. Use water spray/fog for cooling. Notify authorities if liquid enters sewer or public waters.

PART 5 - EMERGENCY AND FIRST AID

Inhalation: If overcome by exposure, remove victim to fresh air immediately. Give oxygen or artificial respiration as needed. Obtain emergency medical attention, prompt action is essential.
Eye Contact: In case of eye contact, immediately flush eyes with clean water for 20 - 30 minutes. Retract eyelids often. Obtain emergency medical attention if pain, blinking, tears, or redness persist.
Skin Contact: Remove contaminated clothing as needed. Wash skin thoroughly with mild soap and water. Flush with lukewarm water for 15 minutes. If sticky, use waterless hand cleaner first.
Ingestion: If large quantity is swallowed, give lukewarm water (1 pint) if victim is completely conscious and alert. Do not induce vomiting, risk of damage to lungs exceeds poisoning risk. Obtain emergency medical attention.
Emergency Medical Treatment: Treat symptomatically.

PART 6 - EFFECTS OF EXPOSURE

Routes of exposure:

Inhalation: This material is not expected to present an inhalation hazard at standard conditions due to its low volatility. However, overexposure to mists/aerosols may cause respiratory tract irritation such as coughing, shortness of breath, and mucus production.

Eye Contact: Potential route. May cause eye irritation. Symptoms may include tearing, blinking, redness and swelling.

Skin absorption: Potential route. Although no data was found for this product, the potential for skin absorption does exist.

Skin Irritation: Potential route. May produce skin irritation. May cause an allergic skin reaction in some individuals after repeated skin contact.

Ingestion: This material may be a health hazard if ingested in large quantities.

Medical conditions aggravated by exposure: No additional medical information found.

PART 7 - PROTECTIVE EQUIPMENT AND CONTROL MEASURES

Respiratory Protection: If this material is handled under mist forming conditions, use NIOSH/MSHA approved respiratory protection equipment.

Eye Protection: Eye protection such as chemical splash goggles and/or face shield must be worn when possibility exists for eye contact due to splashing or spraying, liquid, airborne particles, or vapor. Contact lenses should not be worn.

Skin Protection: Depending on the conditions for use, protective gloves, apron, boots, head, and face protection should be worn. This equipment should be cleaned after each use.

Engineering Controls: If handling results in mist or aerosol or vapor generation, local exhaust ventilation is recommended.

Other Hygienic Practices: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Other Work Practices: Use good personal hygiene. Wash hands before eating, drinking, smoking, or using the toilet facilities. Promptly remove soiled clothing and wash thoroughly before reuse. Shower after work using plenty of soap and water.

PART 8 - REACTIVITY DATA

Stability: Stable

Incompatibility: Strong bases and acids.

Hazardous polymerization: Will not occur.

Hazardous decomposition: Will not occur.

PART 9 - SPILL OR LEAK PROCEDURES

Avoid all personal contact. Take up with absorbent material. Scoop and vacuum up, place in closed container for disposal. Avoid dusting. Flush contaminated area with water. Dispose in accordance with federal, state, and local regulations.

PART 10 - STORAGE AND SPECIAL PRECAUTIONS

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

Practice caution and personal cleanliness to avoid skin and eye contact. Avoid breathing vapors of heated material.

PART 11 - REGULATORY INFORMATION

TRANSPORTATION

Not Regulated

PART 12 - LABEL INFORMATION

FOR INDUSTRIAL USE ONLY!! Skin contact hazard. Eye and skin irritant.

May cause allergic reaction. Avoid contact with eyes, skin, and clothing. Do not breath vapors or mist. Wash thoroughly after handling.

Do not swallow. Prevent contact with food, chewing or smoking materials.

FIRST AID

EYES: Immediately flush with plenty of clean water

INHALATION: Remove to fresh air if effects occur. Consult a physician.

SKIN CONTACT: Wash thoroughly with mild soap and flowing water or shower.

INGESTION: Give fluids. Call a physician.

NOTE TO PHYSICIAN: No specific antidote. Supportive care. Treatment based on judgment of physician in response to reaction of the patient.

Some of the information presented and conclusions drawn herein are from sources other than direct test data on the product itself. The information in this MSDS was obtained from sources which we believe are reliable. However, the information is provided without any warranty, express or implied, regarding its correctness. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage, or expense arising out of or in any way connected with the handling, storage, use, or disposal of the product. This MSDS was prepared and is to be used only for this product. If the product is used as a component in another product, this MSDS information may not be applicable. This MSDS has been prepared in accordance with the requirements of the OSHA Hazard Communication Standard (29 CFR 1200).



Product Information Sheet

Product: Exterior Semitransparent Stain Redwood

Purpose: Beautify and protect exterior wood surfaces with a Zero VOC product
Fade resistant, all acrylic high quality exterior finish

Weight per gallon: 8.90 pounds per gallon

Nonvolatile : 30 - 31% by weight

Dry Times: 1- 2 hours dry hard, recoat 2 hours

Surface preparation: New wood- Loose wood fibers shall be removed with a stiff bristle brush. All surfaces must be clean and free of all dust, mildew, oil, soot, and other contaminants. Smooth wood and mill glazed wood should be scuff sanded.

Previously painted wood- All surfaces must be clean and free of all dust, mildew, oil, soot, and other contaminants. Wash all surfaces completely with a detergent solution and rinsed thoroughly with clean water. Allow to dry before painting.

If mildew is present, the surface should be treated with a solution of 4 parts water and 1 part household bleach. This should dry on the surface and then the surface should be rinsed with clean water and let dry before painting.

Application – Stir thoroughly. Use a synthetic bristle brush, roller with at least ½” nap, or airless spray using a tip size of 0.017” to 0.021”. On rough woods, the coating should be back brushed while wet to force the coating into all the texture of the wood.

One coat should be sufficient on previously painted surfaces, two coats on new and/or rough sawn woods. Coverage - On rough woods – 150 to 250 square feet , on smooth wood 250 to 400 square feet. Cleanup with soap and water

Precautions:

Do not apply below 50° F, when rain is expected or late in the day when dew will form.

Do not apply in direct sunlight.

Do not allow to freeze

No thinning recommended.

MATERIAL SAFETY DATA SHEET

PRODUCT: Adhesive Coatings Exterior Semitransparent Stain Redwood

PART 1 - GENERAL INFORMATION

Manufacturer:	NPCA HMIS Rating
Adhesive Coatings	Health: 1
2471 Peralta Street	Flammability: 0
Oakland, CA 94607	Reactivity: 0
(510) 451-2470	Personal Protection: D

Emergency Numbers: 1-800-424-9300 (Chemtrec)

Chemical Family:	Latex Paint
Generic Name:	Water Based Paint
DOT Proper Shipping Name:	Water Based Paint, n.o.s.
DOT Hazard Class:	Not Regulated
Revision: 3 Date: 3/16/01	

PART 2 - Ingredients

Ingredient Name	CAS #	%weight	OSHA(pel)	ACGIH(tlv)
Acrylic Co-polymer	25987-66-0	20-40	n/a	n/a
Zinc Borate	12513-27-8	0.5-5%	n/a	n/a

PART 3 - PHYSICAL AND CHEMICAL DATA

VOC of Material:	0 grams/liter and 0 #/gal	Boiling Point:	100°C
VOC excluding water:	0 grams/liter and 0 #/gal	pH:	7.5 - 9
Volatile portion:	45-75 % wt	Freezing Point:	0°C
Specific Gravity:	1.0-1.3 @20°C	Viscosity:	60-85 KU
Solubility in water:	Dilutable	Vapor Pressure:	Negligible
Appearance and Odor:	Thick White Liquid / mild odor		
Conditions and materials to avoid:	High temperatures, oxidizing conditions.		
Hazardous decomposition products:	Acrid smoke, fumes, carbon monoxide/dioxide may be released upon decomposition.		

PART 4 - FIRE AND EXPLOSION

Flash Point: > 250°C (Method: ISO 3679)
Autoignition temperature: N/DA
Flammable limits (%volume in air) Lower: N/DA Upper: N/DA
Fire and explosion hazards: Not-flammable
Extinguishing media: Dry chemical, CO₂, Water spray, Foam, Water fog.
Special fire-fighting procedures: Do not enter fire area without special protection. Fight fire from safe distance or protected location. Heat or impurities may increase temperature, build pressure, rupture closed containers spreading fire and increase the risk of burns and injuries. Use water spray/fog for cooling. Notify authorities if liquid enters sewer or public waters.

PART 5 - EMERGENCY AND FIRST AID

Inhalation: If overcome by exposure, remove victim to fresh air immediately. Give oxygen or artificial respiration as needed. Obtain emergency medical attention, prompt action is essential.
Eye Contact: In case of eye contact, immediately flush eyes with clean water for 20 - 30 minutes. Retract eyelids often. Obtain emergency medical attention if pain, blinking, tears, or redness persist.
Skin Contact: Remove contaminated clothing as needed. Wash skin thoroughly with mild soap and water. Flush with lukewarm water for 15 minutes. If sticky, use waterless hand cleaner first.
Ingestion: If large quantity is swallowed, give lukewarm water (1 pint) if victim is completely conscious and alert. Do not induce vomiting, risk of damage to lungs exceeds poisoning risk. Obtain emergency medical attention.
Emergency Medical Treatment: Treat symptomatically.

PART 6 - EFFECTS OF EXPOSURE

Routes of exposure:

Inhalation: This material is not expected to present an inhalation hazard at standard conditions due to its low volatility. However, overexposure to mists/aerosols may cause respiratory tract irritation such as coughing, shortness of breath, and mucus production.

Eye Contact: Potential route. May cause eye irritation. Symptoms may include tearing, blinking, redness and swelling.

Skin absorption: Potential route. Although no data was found for this product, the potential for skin absorption does exist.

Skin Irritation: Potential route. May produce skin irritation. May cause an allergic skin reaction in some individuals after repeated skin contact.

Ingestion: This material may be a health hazard if ingested in large quantities.

Medical conditions aggravated by exposure: No additional medical information found.

PART 7 - PROTECTIVE EQUIPMENT AND CONTROL MEASURES

Respiratory Protection: If this material is handled under mist forming conditions, use NIOSH/MSHA approved respiratory protection equipment.

Eye Protection: Eye protection such as chemical splash goggles and/or face shield must be worn when possibility exists for eye contact due to splashing or spraying, liquid, airborne particles, or vapor. Contact lenses should not be worn.

Skin Protection: Depending on the conditions for use, protective gloves, apron, boots, head, and face protection should be worn. This equipment should be cleaned after each use.

Engineering Controls: If handling results in mist or aerosol or vapor generation, local exhaust ventilation is recommended.

Other Hygienic Practices: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Other Work Practices: Use good personal hygiene. Wash hands before eating, drinking, smoking, or using the toilet facilities. Promptly remove soiled clothing and wash thoroughly before reuse. Shower after work using plenty of soap and water.

PART 8 - REACTIVITY DATA

Stability: Stable

Incompatibility: Strong bases and acids.

Hazardous polymerization: Will not occur.

Hazardous decomposition: Will not occur.

PART 9 - SPILL OR LEAK PROCEDURES

Avoid all personal contact. Take up with absorbent material. Scoop and vacuum up, place in closed container for disposal. Avoid dusting. Flush contaminated area with water. Dispose in accordance with federal, state, and local regulations.

PART 10 - STORAGE AND SPECIAL PRECAUTIONS

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

Practice caution and personal cleanliness to avoid skin and eye contact. Avoid breathing vapors of heated material.

PART 11 - REGULATORY INFORMATION

TRANSPORTATION

Not Regulated

PART 12 - LABEL INFORMATION

FOR INDUSTRIAL USE ONLY!! Skin contact hazard. Eye and skin irritant.

May cause allergic reaction. Avoid contact with eyes, skin, and clothing. Do not breath vapors or mist. Wash thoroughly after handling.

Do not swallow. Prevent contact with food, chewing or smoking materials.

FIRST AID

EYES: Immediately flush with plenty of clean water

INHALATION: Remove to fresh air if effects occur. Consult a physician.

SKIN CONTACT: Wash thoroughly with mild soap and flowing water or shower.

INGESTION: Give fluids. Call a physician.

NOTE TO PHYSICIAN: No specific antidote. Supportive care. Treatment based on judgment of physician in response to reaction of the patient.

Some of the information presented and conclusions drawn herein are from sources other than direct test data on the product itself. The information in this MSDS was obtained from sources which we believe are reliable. However, the information is provided without any warranty, express or implied, regarding its correctness. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage, or expense arising out of or in any way connected with the handling, storage, use, or disposal of the product. This MSDS was prepared and is to be used only for this product. If the product is used as a component in another product, this MSDS information may not be applicable. This MSDS has been prepared in accordance with the requirements of the OSHA Hazard Communication Standard (29 CFR 1200).

Product Information Sheet

Product: Interior Wood Stain Cherry WST-5

Purpose: Highlighting the grain and adding to the beauty of uncoated wood surfaces. This waterbased wiping stain enriches the color and enhances the fade resistance of woods and provides a good base for almost any kind of clear topcoat. This is a Zero VOC product.

Weight per gallon : 8.57 pounds per gallon

Nonvolatile: 11.3% by weight

Dry Times: Dry times will vary upon atmospheric conditions and wood type. In most cases, it can be topcoated with 3 hours.

Surface Preparation: This product is intended for use on bare wood or wood with a conditioner used previously. If there is an existing coating, it must be sanded off. Sand wood surface with 120 grit or finer sandpaper (not steel wool) moving in the direction of the wood grain. Remove sanding dust.

Application: Stir stain thoroughly- do not shake. The stain may be applied with a nylon polyester brush, foam brush staining pad or clean lint-free rag. Allow stain to penetrate until color desired is achieved but do not let the stain dry out. Stain small areas and maintain a wet edge to unify appearance. While stain is still wet, remove the excess with a clean cloth. Wipe in the direction of the wood grain. A second application of the stain can be applied to intensify the color by letting the first coat dry for 1 hour then proceed as above.

Coverage- 400 square feet per gallon or 100 square feet per quart.

Thinning is not recommended but it may be diluted with water.

Let stain dry at least 3 hours before topcoating, overnight if using a solvent based topcoat
This is a stain and must be topcoated.

Cleanup with soap and water.

Do not allow product to freeze.

MATERIAL SAFETY DATA SHEET

PRODUCT: Adhesive Coatings Interior Wood Stain Cherry WST-5

PART 1 - GENERAL INFORMATION

Manufacturer:

Adhesive Coatings
2471 Peralta Street
Oakland, CA 94607
(510) 451-2470

NPCA HMIS Rating

Health: 1
Flammability: 0
Reactivity: 0
Personal Protection: D

Emergency Numbers: 1-800-424-9300 (Chemtrec)

Chemical Family:

Latex Paint

Generic Name:

Water Based Paint

DOT Proper Shipping Name:

Water Based Paint, n.o.s.

DOT Hazard Class:

Not Regulated

Revision: 3 Date: 3/16/01

PART 2 - Ingredients

Ingredient Name	CAS #	%weight	OSHA(pe)	ACGIH(tlv)
Acrylic Co-polymer	25987-66-0	20-40	n/a	n/a

PART 3 - PHYSICAL AND CHEMICAL DATA

VOC of Material: 0 grams/liter and 0 #/gal

Boiling Point: 100°C

VOC excluding water: 0 grams/liter and 0 #/gal

pH: 7.5 - 9

Volatile portion: 65-90 % wt

Freezing Point: 0°C

Specific Gravity: 1.0-1.3 @20°C

Viscosity: 60-85 KU

Solubility in water: Dilutable

Vapor Pressure: Negligible

Appearance and Odor: Thick White Liquid / mild odor

Conditions and materials to avoid: High temperatures, oxidizing conditions.

Hazardous decomposition products: Acid smoke, fumes, carbon monoxide/dioxide may be released upon decomposition.

PART 4 - FIRE AND EXPLOSION

Flash Point: > 250°C (Method: ISO 3679)

Autoignition temperature: N/DA

Flammable limits (%volume in air) Lower: N/DA Upper: N/DA

Fire and explosion hazards: Not-flammable

Extinguishing media: Dry chemical, CO₂, Water spray, Foam, Water fog.

Special fire-fighting procedures: Do not enter fire area without special protection. Fight fire from safe distance or protected location. Heat or impurities may increase temperature, build pressure, rupture closed containers spreading fire and increase the risk of burns and injuries. Use water spray/fog for cooling. Notify authorities if liquid enters sewer or public waters.

PART 5 - EMERGENCY AND FIRST AID

Inhalation: If overcome by exposure, remove victim to fresh air immediately. Give oxygen or artificial respiration as needed. Obtain emergency medical attention, prompt action is essential.

Eye Contact: In case of eye contact, immediately flush eyes with clean water for 20 - 30 minutes. Retract eyelids often. Obtain emergency medical attention if pain, blinking, tears, or redness persist.

Skin Contact: Remove contaminated clothing as needed. Wash skin thoroughly with mild soap and water. Flush with lukewarm water for 15 minutes. If sticky, use waterless hand cleaner first.

Ingestion: If large quantity is swallowed, give lukewarm water (1 pint) if victim is completely conscious and alert. Do not induce vomiting, risk of damage to lungs exceeds poisoning risk. Obtain emergency medical attention.

Emergency Medical Treatment: Treat symptomatically.

PART 6 - EFFECTS OF EXPOSURE

Routes of exposure:

Inhalation: This material is not expected to present an inhalation hazard at standard conditions due to its low volatility. However, overexposure to mists/aerosols may cause respiratory tract irritation such as coughing, shortness of breath, and mucus production.

Eye Contact: Potential route. May cause eye irritation. Symptoms may include tearing, blinking, redness and swelling.

Skin absorption: Potential route. Although no data was found for this product, the potential for skin absorption does exist.

Skin Irritation: Potential route. May produce skin irritation. May cause an allergic skin reaction in some individuals after repeated skin contact.

Ingestion: This material may be a health hazard if ingested in large quantities.

Medical conditions aggravated by exposure: No additional medical information found.

PART 7 - PROTECTIVE EQUIPMENT AND CONTROL MEASURES

Respiratory Protection: If this material is handled under mist forming conditions, use NIOSH/MSHA approved respiratory protection equipment.

Eye Protection: Eye protection such as chemical splash goggles and/or face shield must be worn when possibility exists for eye contact due to splashing or spraying, liquid, airborne particles, or vapor. Contact lenses should not be worn.

Skin Protection: Depending on the conditions for use, protective gloves, apron, boots, head, and face protection should be worn. This equipment should be cleaned after each use.

Engineering Controls: If handling results in mist or aerosol or vapor generation, local exhaust ventilation is recommended.

Other Hygienic Practices: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Other Work Practices: Use good personal hygiene. Wash hands before eating, drinking, smoking, or using the toilet facilities. Promptly remove soiled clothing and wash thoroughly before reuse. Shower after work using plenty of soap and water.

PART 8 - REACTIVITY DATA

Stability: Stable

Incompatibility: Strong bases and acids.

Hazardous polymerization: Will not occur.

Hazardous decomposition: Will not occur.

PART 9 - SPILL OR LEAK PROCEDURES

Avoid all personal contact. Take up with absorbent material. Scoop and vacuum up, place in closed container for disposal. Avoid dusting. Flush contaminated area with water. Dispose in accordance with federal, state, and local regulations.

PART 10 - STORAGE AND SPECIAL PRECAUTIONS

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

Practice caution and personal cleanliness to avoid skin and eye contact. Avoid breathing vapors of heated material.

PART 11 - REGULATORY INFORMATION

TRANSPORTATION

Not Regulated

PART 12 - LABEL INFORMATION

FOR INDUSTRIAL USE ONLY!! Skin contact hazard. Eye and skin irritant.

May cause allergic reaction. Avoid contact with eyes, skin, and clothing. Do not breath vapors or mist. Wash thoroughly after handling.

Do not swallow. Prevent contact with food, chewing or smoking materials.

FIRST AID

EYES: Immediately flush with plenty of clean water

INHALATION: Remove to fresh air if effects occur. Consult a physician.

SKIN CONTACT: Wash thoroughly with mild soap and flowing water or shower.

INGESTION: Give fluids. Call a physician.

NOTE TO PHYSICIAN: No specific antidote. Supportive care. Treatment based on judgment of physician in response to reaction of the patient.

Some of the information presented and conclusions drawn herein are from sources other than direct test data on the product itself. The information in this MSDS was obtained from sources which we believe are reliable. However, the information is provided without any warranty, express or implied, regarding its correctness. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage, or expense arising out of or in any way connected with the handling, storage, use, or disposal of the product. This MSDS was prepared and is to be used only for this product. If the product is used as a component in another product, this MSDS information may not be applicable. This MSDS has been prepared in accordance with the requirements of the OSHA Hazard Communication Standard (29 CFR 1200).

Product Information Sheet

Product: Sanding Sealer WSS-9D

Purpose: To seal the grain of uncoated wood or stains and allow sanding to smooth the surface before topcoats are applied . This is a fast drying waterbased clear sealer with Zero VOCs that can be applied by brush or spray. It provides a high clarity sealer that is stearate free for maximum topcoat adhesion. This sealer is compatible with most topcoats except solventborne nitrocellulose types. Check compatibilty first.

Weight per gallon: 8.63

Nonvolatile: 26-27 %

Flashpoint: > 200° F

Dry Times: 1 hour to recoat with most waterbased finishes, dependent film thickness and on atmospheric conditions. Solventborne topcoats may take longer. Dry to sand in 1- 3 hours dependent upon film thickness and on atmospheric conditions.

Surface preparation: The wood should be clean and dry. If being used on new wood, sand the wood in the direction of the grain lightly with 120 grit sandpaper (not steel wool). Remove dust. Over stained wood, the stain must be fully cured, see stain manufacturer's recommendations.

Application: Stir before application- do not shake. The sealer may be sprayed with a conventional airgun, HPLV gun, airless (.017 tip) or brushed. Rolling is not recommended. A full wet brush coat or 3-4 mils wet spray coat is recommended. The sealer will be ready for sanding in 3-4 hours depending on weather conditions. Grain raise will occur to differing degrees depending on the wood and whether or not it was stained. Often soft woods such as pine will have more grain raise and hardwoods such as cherry will have less. Oak will have more grain raise than maple. The sealer should be sanded with 220 or finer before the topcoat is applied.

Coverage: 350-400 sq.ft/gal

Thinning is not recommended

Clean up with soap and water

Protect from freezing

MATERIAL SAFETY DATA SHEET

PRODUCT: Adhesive Coatings Sanding Sealer WSS-9D

PART 1 - GENERAL INFORMATION

Manufacturer:	NPCA HMIS Rating
Adhesive Coatings	Health: 1
2471 Peralta Street	Flammability: 0
Oakland, CA 94607	Reactivity: 0
(510) 451-2470	Personal Protection: D

Emergency Numbers: 1-800-424-9300 (Chemtrec)

Chemical Family:	Latex Paint
Generic Name:	Water Based Paint
DOT Proper Shipping Name:	Water Based Paint, n.o.s.
DOT Hazard Class:	Not Regulated
Revision: 3 Date: 3/16/01	

PART 2 - Ingredients

Ingredient Name	CAS #	%weight	OSHA(pe)	ACGIH(tlv)
Acrylic Co-polymer	25987-66-0	20-40	n/a	n/a

PART 3 - PHYSICAL AND CHEMICAL DATA

VOC of Material:	0 grams/liter and 0 #/gal	Boiling Point:	100°C
VOC excluding water:	0 grams/liter and 0 #/gal	pH:	7.5 - 9
Volatile portion:	45-75 % wt	Freezing Point:	0°C
Specific Gravity:	1.0-1.3 @20°C	Viscosity:	50-75 KU
Solubility in water:	Dilutable	Vapor Pressure:	Negligible

Appearance and Odor: Thick White Liquid / mild odor
Conditions and materials to avoid: High temperatures, oxidizing conditions.
Hazardous decomposition products: Acrid smoke, fumes, carbon monoxide/dioxide may be released upon decomposition.

PART 4 - FIRE AND EXPLOSION

Flash Point: > 250°C (Method: ISO 3679)
Autoignition temperature: N/DA
Flammable limits (%volume in air) Lower: N/DA Upper: N/DA
Fire and explosion hazards: Not-flammable
Extinguishing media: Dry chemical, CO₂, Water spray, Foam, Water fog.
Special fire-fighting procedures: Do not enter fire area without special protection. Fight fire from safe distance or protected location. Heat or impurities may increase temperature, build pressure, rupture closed containers spreading fire and increase the risk of burns and injuries. Use water spray/fog for cooling. Notify authorities if liquid enters sewer or public waters.

PART 5 - EMERGENCY AND FIRST AID

Inhalation: If overcome by exposure, remove victim to fresh air immediately. Give oxygen or artificial respiration as needed. Obtain emergency medical attention, prompt action is essential.
Eye Contact: In case of eye contact, immediately flush eyes with clean water for 20 - 30 minutes. Retract eyelids often. Obtain emergency medical attention if pain, blinking, tears, or redness persist.
Skin Contact: Remove contaminated clothing as needed. Wash skin thoroughly with mild soap and water. Flush with lukewarm water for 15 minutes. If sticky, use waterless hand cleaner first.
Ingestion: If large quantity is swallowed, give lukewarm water (1 pint) if victim is completely conscious and alert. Do not induce vomiting, risk of damage to lungs exceeds poisoning risk. Obtain emergency medical attention.
Emergency Medical Treatment: Treat symptomatically.

PART 6 - EFFECTS OF EXPOSURE

Routes of exposure:

Inhalation: This material is not expected to present an inhalation hazard at standard conditions due to its low volatility. However, overexposure to mists/aerosols may cause respiratory tract irritation such as coughing, shortness of breath, and mucus production.

Eye Contact: Potential route. May cause eye irritation. Symptoms may include tearing, blinking, redness and swelling.

Skin absorption: Potential route. Although no data was found for this product, the potential for skin absorption does exist.

Skin Irritation: Potential route. May produce skin irritation. May cause an allergic skin reaction in some individuals after repeated skin contact.

Ingestion: This material may be a health hazard if ingested in large quantities.

Medical conditions aggravated by exposure: No additional medical information found.

PART 7 - PROTECTIVE EQUIPMENT AND CONTROL MEASURES

Respiratory Protection: If this material is handled under mist forming conditions, use NIOSH/MSHA approved respiratory protection equipment.

Eye Protection: Eye protection such as chemical splash goggles and/or face shield must be worn when possibility exists for eye contact due to splashing or spraying, liquid, airborne particles, or vapor. Contact lenses should not be worn.

Skin Protection: Depending on the conditions for use, protective gloves, apron, boots, head, and face protection should be worn. This equipment should be cleaned after each use.

Engineering Controls: If handling results in mist or aerosol or vapor generation, local exhaust ventilation is recommended.

Other Hygienic Practices: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Other Work Practices: Use good personal hygiene. Wash hands before eating, drinking, smoking, or using the toilet facilities. Promptly remove soiled clothing and wash thoroughly before reuse. Shower after work using plenty of soap and water.

PART 8 - REACTIVITY DATA

Stability: Stable

Incompatibility: Strong bases and acids.

Hazardous polymerization: Will not occur.

Hazardous decomposition: Will not occur.

PART 9 - SPILL OR LEAK PROCEDURES

Avoid all personal contact. Take up with absorbent material. Scoop and vacuum up, place in closed container for disposal. Avoid dusting. Flush contaminated area with water. Dispose in accordance with federal, state, and local regulations.

PART 10 - STORAGE AND SPECIAL PRECAUTIONS

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

Practice caution and personal cleanliness to avoid skin and eye contact. Avoid breathing vapors of heated material.

PART 11 - REGULATORY INFORMATION

TRANSPORTATION

Not Regulated

PART 12 - LABEL INFORMATION

FOR INDUSTRIAL USE ONLY!! Skin contact hazard. Eye and skin irritant.

May cause allergic reaction. Avoid contact with eyes, skin, and clothing. Do not breath vapors or mist. Wash thoroughly after handling. Do not swallow. Prevent contact with food, chewing or smoking materials.

FIRST AID

EYES: Immediately flush with plenty of clean water

INHALATION: Remove to fresh air if effects occur. Consult a physician.

SKIN CONTACT: Wash thoroughly with mild soap and flowing water or shower.

INGESTION: Give fluids. Call a physician.

NOTE TO PHYSICIAN: No specific antidote. Supportive care. Treatment based on judgment of physician in response to reaction of the patient.

Some of the information presented and conclusions drawn herein are from sources other than direct test data on the product itself. The information in this MSDS was obtained from sources which we believe are reliable. However, the information is provided without any warranty, express or implied, regarding its correctness. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage, or expense arising out of or in any way connected with the handling, storage, use, or disposal of the product. This MSDS was prepared and is to be used only for this product. If the product is used as a component in another product, this MSDS information may not be applicable. This MSDS has been prepared in accordance with the requirements of the OSHA Hazard Communication Standard (29 CFR 1200).

Product Information Sheet

Product: Waterproofing Sealer WPS-2

Purpose: A film forming clear sealer for masonry or wood to protect from water. This product is Zero VOC and has very low flammability.

Weight per gallon : 8.38

Nonvolatile : 21.5-22.5%

Surface Preparation: The surface should be free of mildew, dust, oil, soot, and grease. It should be clean and dry.

Application: Stir thoroughly. Do not shake . The sealer maybe applied by brush, roll or low pressure sprayer such as a garden sprayer. The product should be applied until a puddle of sealer remains on the surface for 2 minutes and then redistributed or taken up.

Coverage: This will depend on the porosity of the surface that you are coating.

poured concrete	175- 200 sq.ft /gal
rough sawn wood	100 sq.ft/gal
smooth wood	200-250 sq.ft/gal
porous clay tile	175- 200 sq.ft/gal.
plywood	175-200 sq.ft/gal.

Thinning is not recommended

Clean up with soap and water

Protect from Freezing

MATERIAL SAFETY DATA SHEET

PRODUCT: Adhesive Coatings Waterproofing Sealer WPS-2

PART 1 - GENERAL INFORMATION

Manufacturer:
Adhesive Coatings
2471 Peralta Street
Oakland, CA 94607
(510) 451-2470

NPCA HMIS Rating
Health: 1
Flammability: 0
Reactivity: 0
Personal Protection: D

Emergency Numbers: 1-800-424-9300 (Chemtrec)

Chemical Family: Latex Paint
Generic Name: Water Based Paint
DOT Proper Shipping Name: Water Based Paint, n.o.s.
DOT Hazard Class: Not Regulated
Revision: 3 Date: 3/16/01

PART 2 - Ingredients

Ingredient Name	CAS #	%weight	OSHA(PEL)	ACGIH(tlv)
Acrylic Co-polymer	25987-66-0	10-50	n/a	n/a

PART 3 - PHYSICAL AND CHEMICAL DATA

VOC of Material: 0 grams/liter and 0 #/gal
VOC excluding water: 0 grams/liter and 0 #/gal
Volatile portion: 55-85 % wt
Specific Gravity: 1.0-1.3 @20°C
Solubility in water: Dilutable
Appearance and Odor: Thick White Liquid / mild odor
Conditions and materials to avoid: High temperatures, oxidizing conditions.
Hazardous decomposition products: Acrid smoke, fumes, carbon monoxide/dioxide may be released upon decomposition.

Boiling Point: 100°C
pH: 7.5 - 9
Freezing Point: 0°C
Viscosity: 50-75 KU
Vapor Pressure: Negligible

PART 4 - FIRE AND EXPLOSION

Flash Point: > 250°C (Method: ISO 3679)
Autoignition temperature: N/DA
Flammable limits (%volume in air) Lower: N/DA Upper: N/DA
Fire and explosion hazards: Not-flammable
Extinguishing media: Dry chemical, CO₂, Water spray, Foam, Water fog.
Special fire-fighting procedures: Do not enter fire area without special protection. Fight fire from safe distance or protected location. Heat or impurities may increase temperature, build pressure, rupture closed containers spreading fire and increase the risk of burns and injuries. Use water spray/fog for cooling. Notify authorities if liquid enters sewer or public waters.

PART 5 - EMERGENCY AND FIRST AID

Inhalation: If overcome by exposure, remove victim to fresh air immediately. Give oxygen or artificial respiration as needed. Obtain emergency medical attention, prompt action is essential.
Eye Contact: In case of eye contact, immediately flush eyes with clean water for 20 - 30 minutes. Retract eyelids often. Obtain emergency medical attention if pain, blinking, tears, or redness persist.
Skin Contact: Remove contaminated clothing as needed. Wash skin thoroughly with mild soap and water. Flush with lukewarm water for 15 minutes. If sticky, use waterless hand cleaner first.
Ingestion: If large quantity is swallowed, give lukewarm water (1 pint) if victim is completely conscious and alert. Do not induce vomiting, risk of damage to lungs exceeds poisoning risk. Obtain emergency medical attention.
Emergency Medical Treatment: Treat symptomatically.

PART 6 - EFFECTS OF EXPOSURE

Routes of exposure:

Inhalation: This material is not expected to present an inhalation hazard at standard conditions due to its low volatility. However, overexposure to mists/aerosols may cause respiratory tract irritation such as coughing, shortness of breath, and mucus production.

Eye Contact: Potential route. May cause eye irritation. Symptoms may include tearing, blinking, redness and swelling.

Skin absorption: Potential route. Although no data was found for this product, the potential for skin absorption does exist.

Skin Irritation: Potential route. May produce skin irritation. May cause an allergic skin reaction in some individuals after repeated skin contact.

Ingestion: This material may be a health hazard if ingested in large quantities.

Medical conditions aggravated by exposure: No additional medical information found.

PART 7 - PROTECTIVE EQUIPMENT AND CONTROL MEASURES

Respiratory Protection: If this material is handled under mist forming conditions, use NIOSH/MSHA approved respiratory protection equipment.

Eye Protection: Eye protection such as chemical splash goggles and/or face shield must be worn when possibility exists for eye contact due to splashing or spraying, liquid, airborne particles, or vapor. Contact lenses should not be worn.

Skin Protection: Depending on the conditions for use, protective gloves, apron, boots, head, and face protection should be worn. This equipment should be cleaned after each use.

Engineering Controls: If handling results in mist or aerosol or vapor generation, local exhaust ventilation is recommended.

Other Hygienic Practices: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Other Work Practices: Use good personal hygiene. Wash hands before eating, drinking, smoking, or using the toilet facilities. Promptly remove soiled clothing and wash thoroughly before reuse. Shower after work using plenty of soap and water.

PART 8 - REACTIVITY DATA

Stability: Stable

Incompatibility: Strong bases and acids.

Hazardous polymerization: Will not occur.

Hazardous decomposition: Will not occur.

PART 9 - SPILL OR LEAK PROCEDURES

Avoid all personal contact. Take up with absorbent material. Scoop and vacuum up, place in closed container for disposal. Avoid dusting. Flush contaminated area with water. Dispose in accordance with federal, state, and local regulations.

PART 10 - STORAGE AND SPECIAL PRECAUTIONS

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

Practice caution and personal cleanliness to avoid skin and eye contact. Avoid breathing vapors of heated material.

PART 11 - REGULATORY INFORMATION

TRANSPORTATION

Not Regulated

PART 12 - LABEL INFORMATION

FOR INDUSTRIAL USE ONLY!! Skin contact hazard. Eye and skin irritant.

May cause allergic reaction. Avoid contact with eyes, skin, and clothing. Do not breath vapors or mist. Wash thoroughly after handling.

Do not swallow. Prevent contact with food, chewing or smoking materials.

FIRST AID

EYES: Immediately flush with plenty of clean water

INHALATION: Remove to fresh air if effects occur. Consult a physician.

SKIN CONTACT: Wash thoroughly with mild soap and flowing water or shower.

INGESTION: Give fluids. Call a physician.

NOTE TO PHYSICIAN: No specific antidote. Supportive care. Treatment based on judgment of physician in response to reaction of the patient.

Some of the information presented and conclusions drawn herein are from sources other than direct test data on the product itself. The information in this MSDS was obtained from sources which we believe are reliable. However, the information is provided without any warranty, express or implied, regarding its correctness. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage, or expense arising out of or in any way connected with the handling, storage, use, or disposal of the product. This MSDS was prepared and is to be used only for this product. If the product is used as a component in another product, this MSDS information may not be applicable. This MSDS has been prepared in accordance with the requirements of the OSHA Hazard Communication Standard (29 CFR 1200).

Appendix F

VOC Emissions Reduction Calculation

With Future VOC Limit	With New Coating VOC	VOC Emission Decrease With Future	VOC Emission Decrease With New Coating
332,633	327,287		
275	50		
0.599	0.703		
0.125	0.017		
0.276	0.280		
152.80	20.25	406.55	539.10
0.42	0.06	1.11	1.48

With Future VOC Limit	With New Coating VOC	VOC Emission Decrease With Future	VOC Emission Decrease With New Coating
855,582	1,967,838		
250	50		
0.679	0.894		
0.091	0.006		
0.230	0.100		
286.45	43.49	139.35	382.31
0.78	0.12	0.38	1.05

With Future VOC Limit	With New Coating VOC	VOC Emission Decrease With Future	VOC Emission Decrease With New Coating
	463,997		
	50		
	0.682		
	0.018		
	0.300		
	30.76		374.61
	0.08		1.03

With Future VOC Limit	With New Coating VOC	VOC Emission Decrease With Future	VOC Emission Decrease With New Coating
161,217	272,529		
250	50		
0.481	0.767		
0.148	0.013		
0.372	0.220		
87.28	13.25	190.87	264.90
0.24	0.04	0.52	0.73

With Future VOC Limit	With New Coating VOC	VOC Emission Decrease With Future	VOC Emission Decrease With New Coating
	56,343		
	50		
	0.735		
	0.015		
	0.250		
	3.11		73.00
	0.01		0.20

With Future VOC Limit	With New Coating VOC	VOC Emission Decrease With Future	VOC Emission Decrease With New Coating
67,725	127,662		
250	50		
0.421	0.767		
0.165	0.013		
0.415	0.220		
40.88	6.21	42.74	77.42
0.11	0.02	0.12	0.21

CATEGORY	VOC EMISSIONS (tpd) Current Limit	EMIS REDUC (tpd) Future Limit	EMIS REDUC (tpd) No-VOC Coatings
Clear Wood Finishes-Lacquers	1.53	1.11	0.37
Semitransparent Stains	1.17	0.38	0.67
Clear Wood Finishes-Varnishes	1.11		1.03
Waterproofing Sealer	0.76	0.52	0.21
Sanding Sealers	0.21	0.01	0.19
Opaque Stains	0.23	0.12	0.09
TOTAL	5.01	2.14	2.56

Assumptions:

All no-VOC coatings assumed at 50 g/l VOC

Appendix G

CALCOAST Laboratory Brochure

Calcoast Labs and DL Labs are independent full service materials testing laboratories specializing in the analysis of commercial products such as paints, coatings, sealants and building materials. DL Labs is accredited by the NIST (NVLAP) and the Canadian General Standards Board (CGSB) and is also ISO.9002 / IEC25 approved. Calcoast is certified by the Los Angeles Department of Building and Safety for materials testing, the Federal Drug Enforcement Agency (DEA) for drug analysis, and the California Department of Health Services for hazardous waste analysis.

Laboratory Services

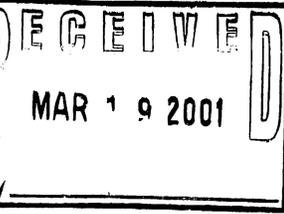
- Failure Analysis
- Conformance testing
- Specification writing
- Building & site sampling
- Coatings formulation
- Microbiological testing
- Quantitative analysis
- Forensic analysis
- Hazardous waste analysis
- Personnel Training
- Industry Surveys
- Market Development
- Testing & Evaluation
- Instrument Calibration
- Certification Testing
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- Differential Scanning Calorimetry
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CALCOAST LABS

California



Robert A. Haffner
Technical Director-Vice President

Antoine Y. Chamsi, Ph. D.
Vice President-Materials Chemistry



Thomas J. Sliva
Technical Director-Vice President

Calcoast Labs
4072 Watts Street
Emeryville, Ca 94608
Phone: 510-652-2979
Fax: 510-652-3085
www.calcoastlabs.com

DL Labs
116 East 16th Street
New York, NY 10003-2174
Phone: 212-777-4445
Fax: 212-505-8419
www.dllabs.com

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We are licensed by the State of California Department of Health Services (ELAP) for hazardous waste analysis. Services include: field sampling, analysis of toxic metals and trace organic contaminants and waste stream effluent monitoring.

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Competitor product analytical matching and reformulation as well as product development in coatings, wood, wood composite and related products.



Thomas R. Fairley
Coatings Specialist

Kevin S. Yan, Ph.D.
Research Scientist

Mechanical and Forensic Analysis

We are experienced in hit-and-run accident evaluation using paint transfer analysis techniques for land and sea vessels.

Arson analysis is performed utilizing Direct Injection, Headspace GC and Mass Spectrometry / Gas Chromatography (MS/GC).

Microbiological Testing

Microbiological testing to Federal, Military and ASTM test procedures for coatings, adhesives, rubbers and other organic polymers, including air sampling for air-borne microbiological pollutants.

Specification Testing

We have extensive background and experience testing coatings and related materials to the requirements of Military, Federal, Boeing, Canadian and other specifications. We do QPL testing for Naval Air and NAVSEA. We are also experienced with the testing of traffic paints and elastomeric roofing materials for conformance to their respective specifications as well as the testing of products used to encapsulate lead-based paint products.

Quantitative Analysis

Identification of organic polymers by Fourier Transform Infra-red Spectroscopy (FTIR) using transmittance and surface (ATR) analysis techniques.

Complete analysis of inorganic components by X-ray Fluorescence and Atomic Absorption Spectroscopy. Solvent and Volatile Organic Content (VOC) analysis using Gas and Liquid Chromatography with EC, TC, FID and NPS detectors by direct injection or headspace analysis. Drug analysis using HPLC and Thin Layer Chromatography.



DL Laboratory Staff



Saul Spindel

Sealant Testing

The laboratories have a broad background in the testing of building seal and sealant materials for conformance to ASTM, ISO and Federal specification. Lab personnel have been in the forefront of developing test methodology as a result of our activity in ASTM C-24, the premier committee for the development of sealant standards.

Failure Analysis

Our personnel are skilled in analytical and microscopic evaluation of field failures of coatings on all substrates and building materials such as sealants, industrial flooring and plastic pipes.

Expert Witness & Litigation Technical Services

Our personnel participate in technical support and expert witness testimony in the fields of coating and materials failures and disputes, slip and fall personal injuries and hazardous materials.

Drug Analysis

We are licensed by the Federal Drug Enforcement Agency (DEA). Both private and forensic drug analyses are performed.

APPENDIX D

TECHNOLOGY ASSESSMENT FOR RULE 1136 – WOOD PRODUCTS COATINGS

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Technology Assessment for Rule 1136 – Wood Products Coatings

June 2003

Deputy Executive Officer

Planning, Rule Development, and Area Sources
Elaine Chang, DrPH

Assistant Deputy Executive Officer

Planning, Rule Development, and Area Sources
Laki Tisopulos, Ph.D., P.E.

Planning and Rules Manager

VOC Rule Development
Larry Bowen, P.E.

Author: William G. Milner - Air Quality Specialist

Reviewed By: Edward M. Muehlbacher, P.E. - Program Supervisor
Frances Keeler – Senior Deputy District Counsel

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EXECUTIVE SUMMARY

Rule 1136 – Wood Products Coatings was amended on June 14, 1996 and set mid range VOC content restrictions, effective July 1, 1997, primarily between 420 and 550 grams VOC per liter for most coating types. These include clear and pigmented topcoats, clear sanding sealers and pigmented primers/undercoats, high and low solids stains, wood fillers and several extremely low use products such as barrier coats, inks, mold-seal coatings, multi-colored coatings, and extreme-performance coatings. Included in the 1996 amendment is a provision for industry to submit progress reports to the AQMD by January 1, 2003, and for the AQMD to conduct a technology assessment by July 1, 2003.

Both the technical assessment and the industrial progress reports are complete and the results of both are contained in this document. Technology exists and is in use today in the form of many resin and solvent systems to meet the July 1, 2005 future VOC limits that are primarily 275 grams VOC per liter, less water and less exempt solvent. Industry has had nearly seven years to convert from high-VOC wood coatings to low-VOC wood coatings; however, approximately 16% have made the change in full. Approximately 32% are partially compliant with the future VOC limits by using at least one form of low-VOC technology. However, approximately 52% have not switched to low-VOC technology despite its availability.

BACKGROUND

On June 14, 1996, the Governing Board of the South Coast Air Quality Management District (AQMD) adopted flexible volatile organic compound (VOC) limits for coatings used on wood products. This action resulted in postponing approximately 9 tons of VOC emission reductions per day, through July 1, 2005. Today, wood finishers have options within the most widely used coating categories of sealers, primers, undercoats, and topcoats. They may either comply with a straight VOC limit of 550 grams of VOC per liter of coating across the board, or, alternatively use a “hybrid” approach that combines the application of still higher VOC sealers, primers, and undercoats with low-VOC clear and pigmented topcoats. In the case of coatings for use on shutters, the reverse hybrid approach is true (low-VOC sealers, primers and undercoats combined with high-VOC topcoats). In either case, the emissions resulting from the use of hybrid coating systems compared to the straight 550 grams VOC per liter approach are equivalent on a solids basis. The rule also affords coating manufacturers flexibility by regulating VOC content on either a per volume basis (grams per liter or pounds per gallon), or on a per weight solids basis (pound VOC per pound of solids).

According to Rule 1136 subdivision (j), all wood finishers are required to submit progress reports to AQMD by January 1, 2003, that details the extent of compliance with the future low-VOC limits of July 1, 2005. The report may either state that compliance with the 2005 limits is already achieved, or it must list the current process, wood species, and the types of coatings used to date, as well as include any test results of low-VOC products tried and further outline the plan by which future compliance will take place. As a reminder to all known wood finishers, staff notified all known facilities by mail of progress report submittal requirements, and included a form for easy reference and fill-in. Staff conducted two such mail outs, one on November 22, 2002, and a second notification on March 20, 2003.

Technology Assessment for Rule 1136 – Wood Products Coatings

Data obtained from the completed progress reports shows the state of wood coatings usage inside the AQMD, and that information is presented in this technology assessment. In addition, staff has researched and witnessed the application of existing low-VOC wood coatings technologies in an effort to determine its applicability and feasibility of use across the spectrum of wood products coating operations. As a result, this report satisfies the audit and technology review requirements of Rule 1136, subdivision (k). Although there are coatings that could provide additional VOC reductions, further limitations on VOC content would reduce the number of compliant technologies available and in use for nearly all applications. The expressed future VOC limits provided by Rule 1136 are established low enough to provide for a broad range of resin systems and cure types that will afford the industry sufficient choice in waterborne, exempt solvent borne, and high-solids coatings while dramatically reducing smog forming compounds. This report details the state of low-VOC-emitting technologies and provides the results of submitted progress reports.

INDUSTRIES SUBJECT TO RULE 1136

There are several industries that use coatings on wood products. In general, they can be grouped as industries that are contained within the following business types. This involves new finishing, refinishing or repair coating to a wide variety of wooden products as follows:

- ✓ Household Furniture;
- ✓ Office and Contract Furniture;
- ✓ Kitchen and Bathroom Cabinets;
- ✓ Architectural Millwork and Store Fixtures;
- ✓ Shutters, Blinds, Doors, Windows and Moldings;
- ✓ Specialty Products (Musical Instruments, Toys, Speaker Cabinets, Picture Frames, Skateboards, etc.);
- ✓ Repair and Refinishing Operations; and
- ✓ Job Shop (a mixture of the above).

EXISTING SUPPORTING TECHNOLOGY

The types of low-VOC coatings formulations available today can fundamentally be broken down into four types: waterborne, exempt solvent borne, high-solids, and 100% solids applications. Within these categories, several resin systems are available including acrylic, polyurethane, alkyd, nitrocellulose, and various copolymers or modifiers including but not limited to latex, polycarbonate, polyethylene, and urea. Many cure types are also available as one-component air-dried and pre-catalyzed, two-component post-catalyzed, thermally cured and light curable. The AQMD does not promote the use of one type of coating formulation or type over another. All of the systems below represent materials that comply with the future limits of Rule 1136, unless stated otherwise.

Waterborne

Waterborne coatings are available in several cure systems consisting of single-part non-catalyzed and pre-catalyzed (chemically reactive upon evaporation of the water), and post-catalyzed plural-component reactive coatings including moisture curable urethanes at zero VOC as well as waterborne ultraviolet (UV) curable coatings. Waterborne wood finishes are available and in use for every application step including stains, sealers, topcoats, toners and glazes, primers and undercoaters, as well as fillers.

The most common resin system in water is acrylic. A good waterborne acrylic will exhibit good to excellent clarity, good to excellent chemical resistance and a high degree of re-emulsifying capabilities when layered upon itself, or upon a coating compatible with an acrylic film. Due to wide variations in formulations, acrylic formulations will range in VOC content from zero to about 275 grams of VOC per liter of coating (less water) and this applies to clear and pigmented topcoats, sealers, primers and undercoaters both. Waterborne acrylic low-solids stains can have VOC contents below 20 grams per liter of material. Some coatings manufacturers have formulated hybrid waterborne systems consisting of blends of acrylic with latex, polyurethane, epoxy, polyethylene and/or polycarbonate. Coating expense increases with the addition of resin modifiers. Typical volume solids content of these coatings vary from about 8% for low-solids stains to approximately 28 to 60% for topcoats and 30 to 66% for pigmented undercoaters and primers. Most waterborne acrylic formulations contain glycol ethers in small percentages (ethylene or propylene). Such chemicals are associated with long term exposure health risks (chronic exposure).

The second most popular resin system in water is polyurethane. These systems range in VOC content from zero to about 200 grams per liter, less water and are relatively high in solids (approximately 50%). Waterborne polyurethanes are fully reacted urethane polymers dispersed in water. Urethanes contain isocyanates as condensation reaction agents, in small percentages, that are also toxic. Waterborne polyurethanes can be selected to deliver strength, chemical resistance, high elongation, UV resistance, low temperature flexibility, water resistance, abrasion resistance, and/or impact resistance. Waterborne polyurethanes are generally compatible with many other types of waterborne coatings such as acrylics and can be used as modifiers for blended resins which further enhance film properties.

Perhaps the largest impediments to successful waterborne coating use on wood is contamination of the surface through either airborne or substrate dusts, improper spray technique, and longer dry time needed prior to stacking the coated product. If the substrate is not clean (and maintained clean) dusts will telegraph through the finish. Edges can also overbuild with improper spray technique and look excessively plastic; so that several thin applications result in better appearance than heavier coats. For high production purposes, fast dry time is crucial to allow packaging and stacking. The solution employed by savvy manufacturers is to reduce the dry time with gas fired or infrared ovens and/or fans that act to accelerate the release of water out of the finish, although there are several plural component coatings on the market that will cure in 15-20 minutes and in humid environments, but are more expensive on a per gallon basis. Process modifications, such as the installation of protective corner pieces, will aid in distribution of the load away from the finished wood substrate when product stacking is necessary.

Exempt Solvent Borne

Acetone is the foundation of high-VOC (540 + grams VOC per liter, less acetone) nitrocellulose resin systems that are still in wide use today. The topcoats attained by these coating systems are easy to apply and redissolve each subsequent coat into the previous one. This forms a single high-build film that is clear, easily sanded, buffed and repaired. There is no question that these coatings afford a beautiful sheen and clarity that provides the basis for coating comparison, particularly on high-end furniture and musical instruments. Reduction to 275 grams VOC per liter, less exempt compounds on or before July 1, 2005, will likely mean the demise of acetone-based co-solvent single-component nitrocellulose topcoats, as well as most catalyzed nitrocellulose coatings, which offer the same appearance but with a harder film.

Some acetone-based wood products coatings are available in low-VOC and in a range of coating types including but not limited to stain, toner, and glaze, sanding sealer, and catalyzed topcoat. High-solids stains, toners and glazes have been developed (and being used) at concentrations below 210 grams VOC per liter of coating. Low-solids stains have also been created at less than 40 grams VOC per liter of material. These coatings may fill the slight void left open by waterborne stains, which can be problematic with respect to color matching. In addition, acetone-based catalyzed varnishes are also available in the 200 grams VOC per liter of coating range that are self-sealing. Dry times of acetone-based products can also be accelerated, if needed, with the addition of infrared light. Typical resin systems in use with acetone today are based on nitrocellulose (stains), vinyl (sealer), alkyd (stains) and modified alkyd (catalyzed topcoats), as well as various proprietary polymers.

The largest hurdle with high quantities of acetone in coatings is excessive evaporation. This can lead to a dry spray edge and coating blushing. Blushing is a haze caused by moisture condensation in the coating film due to excessive evaporative cooling. Acetone also poses a fire hazard due to its high flammability, so that potential users of acetone-based materials should check with their local fire department for any restrictions imposed therein.

High-Solids

When compared to 18% solids of old formulations, almost anything would be considered high-solids, however for the purposes of this section, only materials with at least 75% solids will be considered. The only true candidate at this level of solids is polyester. Polyester finishes are necessarily high build coating systems with excellent grain filling properties. They are available and in use as self-sealing systems in clear and pigmented formulas. One drawback, that they contain the monomer styrene as a viscosity reducer. Styrene is a hazardous air pollutant and a VOC. Typical VOC contents range from 180-250 grams VOC per liter. The odor of styrene is particularly pungent and many operators find the smell objectionable.

Thermally Cured

Within the last few years, powder coatings have been developed, largely for use on medium density fiberboard (MDF). Powders are near 100% dry solids materials (finely divided resins, curing agents, minerals and pigments) that are usually spray applied with the use of a downdraft or backdraft spray booth and reclaiming dust collection system. The effective transfer efficiency or utilization rate of powder coating is about 98% when reclamation techniques are used. Under the conditions of EPA Reference Test Method 24 (Determination of Volatile Matter Content, Density,

Volume Solids, and Weight Solids of Surface Coating), where samples are heated to 110 °C for an hour, a volatile weight loss of approximately 0.5 to 1.0 percent may be present and expressed as off-gas VOCs in the bake cycle.

When powder coating MDF parts using thermally cured powders, wood products are loaded onto an overhead conveyor system, flushed with compressed air (to minimize surface particulate contamination), and preheated before entering the powder coating booth. Preheating improves powder deposition on the low-conductivity substrate and minimizes the manifestation of moisture in the board that outgases and compromises finish quality. While the board surface is still warm, powder is applied electrostatically to the grounded wood substrate which is followed by convection or infrared heating that thermally flows and cures the deposited resins and pigments under low temperature (190 - 250°F). Parts exit the bake cycle and are allowed to cool to ambient temperature and are then ready for assembly or packaging.

In lieu of thermally cured powders, UV curable powders are available for applications that use the same process (i.e., cleaning, preheating, electrostatic application, and heating to flow temperature) but afterward the coating is exposed to ultra-violet light which crosslinks the softened powders in a matter of seconds; as opposed to several minutes with thermally cured powders. Powder coatings on wood are evolving as suitable replacements for thermofoil (high pressure bonded vinyl to MDF), and some high-pressure laminate applications. Powders are available in all finishes (smooth to textured), sheens (low to high gloss), and opacities.

Light Curable

Ultraviolet curable coatings, and transport and lighting configurations have been available for use for over 40 years and the technology is continually improving. Curing systems typically consist of a high voltage power supply, a control panel, UV curing lamp(s), a reflector system for focusing the UV energy, and a cooling system to maintain proper operating temperatures of the UV lamp(s).

The mainstream UV lamp is a mercury lamp. An inert gas, such as argon or xenon, together with a small amount of mercury, is used to fill the tube which has electrodes installed at the ends. When the lamp is connected to a power source, an electrical arc passes between the two electrodes, vaporizing the mercury. A large energy release occurs and results in an extremely bright, intense light that is primarily white light, infrared and ultraviolet light.

The second form of lamp is the electrodeless lamp. This type of lamp has a similar spectral emission to the electrode type but the method of operation is totally different. The lamp in operation is energized by microwaves that are generated by magnetrons rather than an electrical arc. The tube can be filled with other materials depending on the spectral emission required for the application. This type of light is more powerful because it operates at higher frequency than the arc or electrode type lamp.

Most UV curable wood coatings are based on acrylated epoxies, polyesters, and urethane oligomers, which are low to medium molecular weight resins. Monomers are added as reactive diluents (viscosity reducers) and free radical photoinitiators are blended in to set off chain reactions when exposed to UV light and cause polymerization. The remaining component is filler,

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which consist of pigments, stabilizers and surfactants for instance. Cationic UV curable coatings are also available in epoxy based oligomers. Hybrids of various oligomers are now available that enhance final film properties (urethane-acrylic for example).

UV curable coatings are no longer just 100% solids. Waterborne, acetone, and even VOC based UV curable coatings are available to achieve thinner film deposition, reduce toxic monomer content, provide a mechanism to formulate matte finishes (greater shrinkage), and speed up the cure rates of non-UV activated waterborne and solventborne materials. All application types are available from flow coating, roller coater, and sprayable UV coatings in various glosses, and can be formulated in stains and other semitransparent materials, and technology exists to cure pigmented coatings. UV applications are typically conducted on automated lines so that exposure to skin irritants and powerful light sources are minimized to the worker.

Most UV cure processes in application today are for flat-line products (products that are predominantly two-dimensional). However, equipment manufacturers can engineer UV curing equipment to cure three dimensional objects such as fully assembled furniture; but the cost of the curing equipment goes up with each added energy source. UV coating on wood substrates is a viable option to regulatory compliance and coating performance for a wide variety of products. Normally, the advantages associated with the application of UV materials are: higher chemical resistance, increased impact and abrasion resistance, lower energy consumption and small equipment footprint compared to standard bake cycle ovens, increased production rates through rapid curing, elimination of flammability concerns, and the potential for zero-VOC emissions. More information is obtainable from Radtech, the leading association for companies manufacturing UV curable coatings and curing equipment, and for companies using the technology.

Very few companies within the South Coast Air Basin use UV curable coatings on wood substrates. Perhaps because many high production companies have already updated their coating lines to accommodate waterborne coatings by installing infrared or convection ovens and stainless steel plumbing and spray equipment, or by installing air pollution control equipment in the case of high-VOC nitrocellulose lacquers, and are therefore satisfied with their current practices.

TBAc

Tertiary butyl acetate (TBAc) has recently been petitioned to be delisted as a VOC by the US EPA based on its low reactivity to form ozone in the presence of oxides of nitrogen and a light source. To date, the compound is not yet approved as an exempt compound. If, in the near future the EPA and AQMD delists TBAc, nitrocellulose wood topcoats may be able to be formulated as low-solids, low-VOC topcoats. Without TBAc, these coatings will likely be phased out in the South Coast Air Basin due to excessive VOC content. Nitrocellulose wood coatings have been formulated with TBAc, as it is a good viscosity reducer, displays an evaporation rate in the same range as methyl ethyl ketone and toluene (good for blush resistance), and it has a flash point much higher than acetone so that fire hazard is reduced (60 °F compared to -10 °F). At this time, TBAc is not a listed HAP or an AQMD Rule 1401 compound, however, it may potentially metabolize to tert-butanol in the body, which is a toxic compound.

INDUSTRY EXAMPLES

Staff has visited facilities within the boundaries of its jurisdiction in an effort to obtain relative data concerning process and coatings applicability as it currently exists in the local region. The following examples reflect the technology in use during inspections conducted from November 2002 through January 2003.

EXAMPLES OF INDUSTRIES SUCCESSFULLY CONVERTING TO LOW-VOC FINISHES

Southcoast Cabinet Inc.

Southcoast Cabinet is a manufacturer and installer of kitchen and bath cabinetry for the new home construction industry and is located in Walnut, CA. They use melamine-covered MDF board as interior components fabricated to form the box. Sides and tops that show are typically cut from veneered hardwood that is laminated to plywood. Face frames and doors are made from solid wood components. All coated surfaces are meticulously sanded to provide a smooth surface for the application of waterborne low-solids stains, sealers, washcoats, and primarily clear topcoats (some pigmented waterborne topcoats are applied). All types of wood are used and include alder, ash, birch, cherry, maple, mahogany oak, pine and walnut.

Southcoast uses Sherwin Williams products consisting of water reducible low-solids wiping stains and dyes of various colors, acrylic/latex sanding sealer and clear topcoat, as well as a waterborne-modified polyurethane for pigmented topcoats. Their line is conveyerized, and uses multiple spray booths in connection with spray applied and hand wiped stains and washcoats. After each coating step, natural gas-fired ovens are used to drive the water out. Slight sanding is necessary to rub out minimal grain raise. Two coats of waterborne lacquer are used and the finish is clear, hard and glossy. All coatings used meet or are below the July 1, 2005 VOC limits, and meet the Kitchen Cabinet Manufacturers Association (KCMA) specifications.

Proskate

Proskate, located in Anaheim, is a manufacturer of 5-ply laminated skateboards. The boards are assembled and formed under high pressure. Templates are used to cut off excess material and are further processed with routers and sanders. The company uses either three coats of waterborne acrylic sanding sealer as a finished look or will seal and topcoat with a waterborne acrylic pigmented coating. A thermally applied decal is adhered to most boards on top of the cured coating at a temperature of approximately 200 degrees Fahrenheit. SDA/Craft Technologies, a local independent wood coatings formulator that specializes in manufacturing a fully compliant line of dye stains, sealers, primers, and pigmented and clear topcoat waterborne systems is their current vendor.

Acme Billiards

Acme Billiards of Los Angeles is a small manufacturer of pool tables and other high end table top games specializing in custom fabrication only. They use solid woods consisting mainly of cherry, maple, oak and poplar. Acme uses less than 10 gallons of wood products coatings per month, well within the exemption for less than a gallon per day, and could use high-VOC products of any kind on this basis. However, the owner is pleased with the lack of strong odors in his shop and is

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ultimately satisfied with the finish of his waterborne acrylic dye stains, sealers and pre-catalyzed clear topcoats he obtains from SDA/Craft Technologies.

Blackhawk Furniture

Blackhawk Furniture of Riverside, CA is a manufacturer of oak home furniture. The facility uses a conveyor line in association with all applied stains, sealers, and clear topcoats. Infrared (IR) ovens are used to flash proprietary polymer acetone-based high-solids stain and nitrocellulose acetone-based sealer when the weather gets cool or humidity rises. The clear topcoat is a single-component waterborne acrylic flat finish that is force dried by ambient air fans and IR light sources. The coatings are all manufactured by Alternative Materials Technology (AMT), Inc. Blackhawk is a high volume manufacturer and have optimized their production through close work with AMT staff. The topcoat, stain and sealer are below 175 grams of VOC per liter of coating and as such meet all future VOC requirements.

Lloyd's Custom Finishing

Lloyd's Custom Finishing is a job shop coating contractor located in Santa Fe Springs, CA. Lloyd's uses mostly pigmented primers, undercoats and topcoats to finish solid and various wood windows, doors, molding, and shutters. The process uses simple air dry and light sanding to obtain a finish that is smooth, hard and durable. On colder days, a small portable IR heater is directed at the wooden parts to accelerate cure time. The coatings manufacturer is Aqua Coatings which makes only fully compliant waterborne acrylic and modified acrylic coatings ranging from sanding sealers, clear topcoats, low-solids stains, to pigmented primers and topcoats.

Cabinets 2000

Cabinets 2000 is also a manufacturer of kitchen and bath cabinetry for new home installation located in Norwalk, CA. Cabinets 2000 uses a frameless construction (no face frame) and builds its boxes with melamine covered MDF board. In addition to coating, they operate a thermofoil application system. The company is primarily using Valspar alkyd resin based stains in acetone. The topcoat is a two-part catalyzed alkyd-urea conversion varnish in low-luster (30-sheen). When sealers are used, a vinyl-modified system in acetone is employed. Glazes are used for highlighting solid white topcoats but remain high in VOC (445 gm VOC/l). However, the conversion varnish meets the future VOC limit for topcoats, and the stains are well under the 120 grams per liter of material requirement as of July 1, 2005. The company is not fully compliant with all future VOC limits at this time due to the use of the solventborne glaze and marginally higher VOC sealer (300 gm VOC/l, less acetone). KCMA specs are fully attained. In addition, Cabinets 2000 has future plans to install a UV coating line.

Penny Lane

Although technically exempt from VOC regulation because of small usage, Penny Lane Furniture Refinishing is a small owner-operated refinishing shop in Los Angeles that has been using waterborne sealers and topcoats that meet the 2005 limits on a variety of wood substrates for ten years. They do use universal tint colors (UTCs) on occasion that exceed the low-solids stain limit upon application due to high thinning with mineral spirits.

All pieces are fully sanded of old finish, sealed and topcoated with acrylic finishes by Paramount Coatings. In the opinion of the author, the resulting appearance was the best that we had seen with water. Comparing a headboard that had been finished with nitrocellulose lacquer by a refinisher outside the basin, with several coats, the resulting waterborne finish was 90 to 95% of that of nitrocellulose. The only difference was a slightly softer feel between the two in favor of nitrocellulose. The gloss and clarity were every bit as good as the nitrocellulose coated headboard, and the finish was hard as rock. Most finishes are rubbed out with steel wool and wax to reduce the gloss of the waterborne finish to a satin finish, which also looks beautiful.

EXAMPLES OF COMPANIES THAT HAVE FOUND THE TRANSITION TO LOW-VOC DIFFICULT

Cardinal Church Furniture

Cardinal Church Furniture is the last remaining church pew manufacturer in the South Coast Air Basin. They are currently using acetone-based catalyzed clear lacquers, pigmented undercoat, sealer, and stains. All of the materials comply with the current limits at just slightly below 550 grams VOC per liter, less exempt solvent, and the resulting emissions are approximately 3 tons of VOCs per year. With nitrocellulose coatings, pew parts can be coated, stacked, and delivered in 24 hours if the need arises. After having tried waterborne coatings in the past, the owner is highly skeptical about the performance of them due to several jobs that failed. The coatings never cured or would soften in high humidity or under body heat and ultimately transfer to the clothing of church goers. He cites denim as being very abrasive and other fabrics as problematic to the applied coating as he needs a 20 year lifetime scuff resistance to be competitive in this marketplace.

Only 30% of Cardinal's business is new construction. The remaining business is refinishing. Old church furniture is disassembled, brought back to the Irwindale facility, sanded to near bare wood, refinished, stacked and reassembled at the job site within a few days. The owner claims that waterborne coatings do not adhere to old nitrocellulose based coatings, and that dry time is insufficient to stack pew parts without sticking, which is required in his accelerated finishing operation. The owner also claims that color matching existing church finishes is all but impossible with waterborne stains, because of the lack of sufficient penetration into the wood. Staff has reviewed current technology with the shop owner, and has encouraged him to test the latest waterborne coating systems and existing super compliant acetone-based sealers and high solids stains. Staff is committed to working with Cardinal Church Furniture in an effort to address his concerns.

Rickenbacker Guitars

Rickenbacker of Santa Ana holds the distinction of inventing the electric guitar. They turn out 25 guitars per day of both the electric and acoustic type, as well as electric bass guitars from solid wood and in-house manufactured electronics. Each guitar takes approximately 15 days to complete. Among the types of wood used are alder, maple, and walnut for construction of the body and neck. Bubinga wood forms the fingerboard. The guitars are said to be one-piece construction as all the components are interlocking and joined together with adhesive.

Since converting from nitrocellulose lacquers in the early 1970's, Rickenbacker has used high-VOC stains and two-component "conversion varnishes", in successively thin coats to produce its

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characteristic high-gloss finished guitars (85 to 98 percent reflectivity). As many as eleven independent coating layers are spray applied and air-dried with sanding steps in between. The final gloss is achieved by using polishing compounds. The finish of the guitar must withstand extreme temperature differences as their guitars are sold around the world and shipped to various concert sites by jetliner. In addition, the finish must withstand various hand emollients, perspiration, and contact with nitrile rubber from neck straps and soft chlorinated plastics (guitar stand cushions) without deleterious effect. Since guitars are lifetime investments for many musicians, Rickenbacker maintains its reputation by providing the best coating and coating process that will result in lifetime performance and beauty.

The company has a policy to test any and all new coating technologies. Single and dual-component waterborne coatings as well as UV curable have all been tried but have yet to meet its testing standards for coating checking. Coatings applied over thin wood are especially vulnerable to “sinking” of the material into the pores of the wood over time, which causes coating fractures or checking as the material continually shrinks. Rickenbacker claims that this is due to incomplete crosslinking of the coating molecules (even with UV curables). Two other guitar makers (one in Ventura County and the other in San Diego County) have overcome the problem by using dual-cure sealers (catalyst cured and solvent borne UV cured); however, they continue to use high-VOC stains and washcoats. At this time Rickenbacker is continuing to try waterborne samples from SPI Incorporated that is described as *nearly* perfect. However, staff is unaware of any guitar manufacturer that is 100 percent compliant with the future VOC limits of Rule 1136.

Fender Guitar

Fender Guitar of Corona makes the most widely played guitars in the world. They are a large company and manufacture 220 to 300 guitars a day including acoustic and electric guitars as well as acoustic and electric bass guitars for shipment around the globe. Rather than change their process they prefer to use control equipment to capture and abate the emissions stream. They currently use a regenerative thermal oxidizer (RTO) to comply with Rule 1136. The capture system qualifies as a permanent total enclosure, therefore fugitive VOC emissions are said to be 100 percent capture efficient.

The types of coatings used at the Corona Facility are not compliant with the future VOC limits. A high-solids compliant polyester coating is applied in Mexico as a sealer and grain filler from which successive coats of solvent borne nitrocellulose lacquers or polyurethane are added as topcoats in Corona, CA. A waterborne sealer is applied to the neck, but it exceeds the 275 grams VOC per liter of coating limit of July 1, 2005. Notwithstanding the use of add-on control equipment to comply with Rule 1136, staff is unaware of any high-end stringed instrument manufacturer that is fully compliant with the July 1, 2005 VOC limits of Rule 1136 by direct VOC concentration.

PROGRESS REPORTS

The AQMD sent out notification of progress reporting requirements with an accompanying fill-in-the-blank form to 1,061 companies. An additional 21 companies reported without receiving a notification letter. This results in a total number of facilities in the data pool of 1,082. The names and addresses of notified facilities were identified by using the District’s Clean Air Support

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System (CLASS) and the Permit Administration Application Tracking System (PAATS). Out of this total 235 were returned as undeliverable by the U.S. Post Office (Out of Business), 67 reported no Rule 1136 coating activities at the facility, and 366 companies submitted meaningful data (46.92% of the universe of wood finishers). Tables 1 and 2, and Figures 1 and 2 below offer the latest information available as of April 22, 2003.

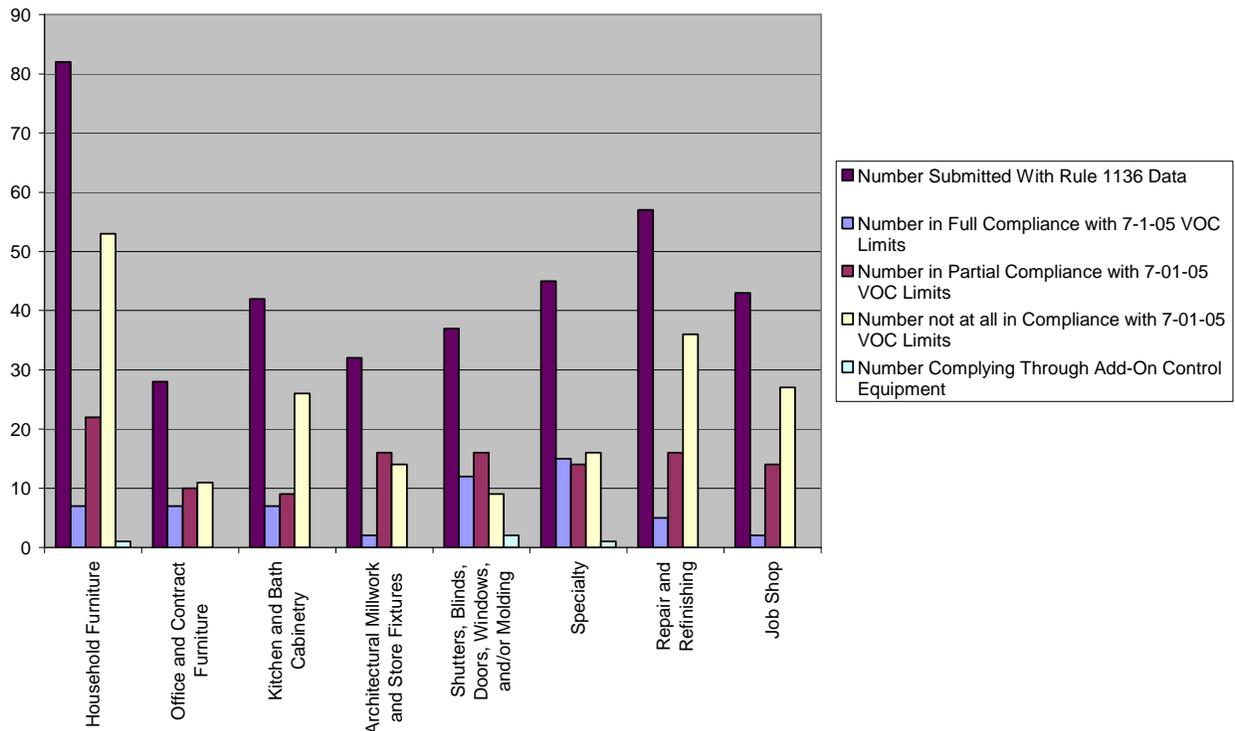
Table 1
Summary of Initial and Final Progress Report Submittals

Total Initial Mailings and Voluntarily Submitted Progress Reports	Total Returned as Undeliverable or Out of Business	Total Responding as not Finishing Wood Products	Universe of Rule 1136 Facilities	Total Responding as Wood Finishers	Percentage of Submitted Progress Reports the Universe of Rule 1136 Facilities
1082	235	67	780	366	46.92%

Furthermore, each of the companies that completed a progress report are grouped below by industry type and whether they are in full compliance, partial compliance (at least one coating meeting the final VOC limits of July 1, 2005), or not meeting the future VOC limits at all. Figure 1 gives this information.

Figure 1

Summary of Compliance with the July 1, 2005 VOC Limits by Industry Type

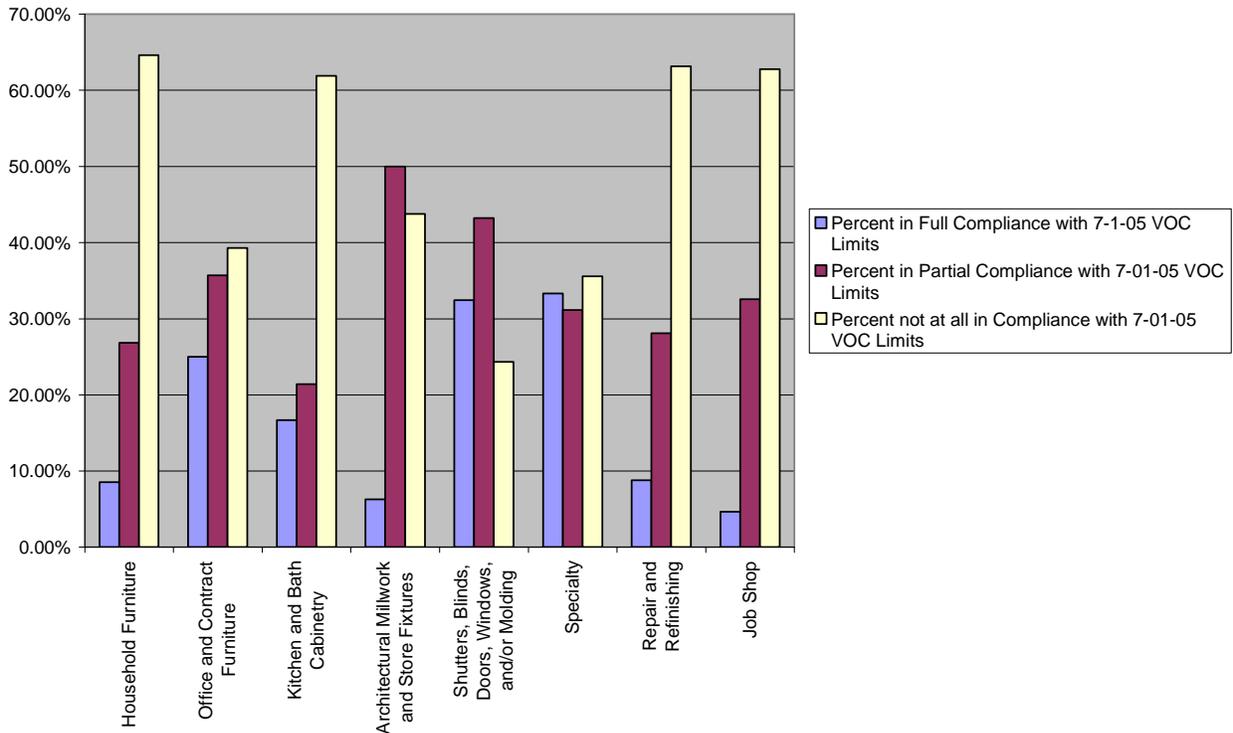


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The compliance statistics expressed as a percentage of the total submittals, by industry category, are shown in Figure 2.

Figure 2

Summary of Compliance as a Percentage by Industry Type



Finally, Table 2 shows the summary of the compliance status for all Rule 1136 facilities that submitted a progress report.

Table 2
Summary of Compliance of All Rule 1136 Reporting Facilities

Facilities in Full Compliance with 7-1-2005 VOC Limits	Facilities in Partial Compliance with 7-1-2005 VOC Limits	Facilities not Meeting any 7-1-2005 VOC Limits
15.57%	31.97%	52.46%

DISCUSSION

Although the wood coating industry have available to it wood products coatings that will work (as demonstrated in most categories, except guitar manufacturing), only 15.6 percent of the companies that submitted progress reports comply with the full provisions of the final VOC limits of July 1, 2005. Four (1.0%) qualify by equivalent compliance with add-on control equipment. However, 32.0 percent partially comply with the final VOC limits by using at least one product that meets the future VOC limits. Still, a full 52.5 percent of the returned progress reports indicate no

compliance with the July 1, 2005 VOC limits. Although the data is not fully represented by all wood finishing facilities, staff believes the data is representative of the whole because of the hundreds of data points included in the analysis.

CONCLUSIONS AND RECOMENDATIONS

Adequately performing wood finishes that meet the July 1, 2005 VOC limits are available and have been successfully used across the spectrum of wood finishing operations including, household, office and contract furniture, cabinets, millwork and store fixtures, shutters, doors and windows, specialty wood products as wells as repair and refinishing operations, as indicated in staff's technology assessment. The expressed future VOC limits provided by Rule 1136 are established low enough to provide for a broad range of resin systems and cure types that will afford the industry sufficient choice in waterborne, exempt solvent borne, and high-solids coatings while dramatically reducing smog forming compounds. Staff believes that technology exists, even for guitar manufacturing that can be utilized within the maximum future limits of Rule 1136, considering there are two more years to go before the final limits take effect.

Successful conversion to waterborne coating systems necessitate a willingness to change, proper training of spray coating personnel, may require additional sanding steps and added heat acceleration, substantially cleaner work surfaces, and good technical support from coating manufacturers.

APPENDIX

Staff conducted a consultation meeting on June 10, 2003 in an effort to solicit public comments on the content of this document. The following represents the comments received on that day. Responses to these comments are included and are as follows:

Comments and Responses

Comment No. 1

We manufacture and recoat church furniture. It has become increasingly more difficult to compete in this business when my competition is able to use coatings that I cannot. Our products need a durability of twenty years due to constant human contact. Nitrocellulose coatings provide that durability for us and allow fast turn around. We tried water based coatings when this rule was adopted and 20 out of 25 jobs had to be refinished due to coating softening and sticking upon stacking. It cost us thousands of dollars to repair the damage caused by the use of waterborne material.

Response

Staff has identified a number of compliant coating systems other than waterborne, including blends of synthetic resins, light curable products, thermally curable coatings, high-solids polyester materials, and exempt solvent borne coatings that will meet the future VOC limits of July 1, 2005 and have been demonstrated in practice to work.. In addition, there is a new generation of waterborne formulations that has developed over the last several years tha is far superior in performance to previous materials and these products may have overcome the difficulties previously experienced.

Comment No. 2

We currently use acetone-based products that meet the future limits and have also spent thousands of dollars replacing waterborne failures as far back as 1985. My concern relates to the growth of my business and a facility cap on emissions that decreases every time I make a change in equipment, be it a modification to a spray booth or the addition of a heater. I have been denied permit changes, and have suffered emission reductions on the basis of best available control technology restrictions. Although my business is growing, I cannot move without losing valuable emission limits.

Response

This issue is the expansion of the operation resulting in an increase in emissions over current levels and compliance with the requirements of Rule 1136. An expansion project for this facility could be handled no differently than any other stationary source that increases emissions. The new or modified equipment would have to be constructed using Best Available Control Technology. The emissions increase must be mitigated and it must be shown that the construction will not cause or contribute to the exceedance of an ambient air quality standard. These requirements are in addition to the source specific rule requirements such as those for Rule 1136 and compliance would be demonstrated through the AQMD permitting process.

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Comment No. 3

See the response to Comment No. 1. There have been improvements in waterborne technology in the last several years. In addition, there are a number of other compliant coating options that do not involve waterborne systems.

Response

The newest waterborne coatings are said to dry to sand within 30 minutes (and some within 15 minutes) of initial application. Stain matching with the latest waterborne dye stains is made easier than in previous years. If there were just a few problems with it, then we would not see any conversions, which is not the case.

Comment No. 4

What is the size distribution profile of companies that submitted progress reports? Within that distribution, what is the difference between large and small users, and what is done at a larger shop? Small shops cannot take the risk to switch to low-VOC without failure because they have little cash reserves. I would like to see socio-economic assessment conducted. There should be a BACT and reformulation equivalency.

Response

Size distribution was not part of the questionnaire data. The progress report questions only reflected responses to categorization of business type, coating process, types of wood coated, VOC contents of finishes used, and questions related to what types of coatings the facility has tried in the past (and its performance), what coatings it will try in the future, any process modifications expected when future limit coatings are tried, if add-on control will be used, and if Mobile Source Reduction Credits (MSRCs) or other alternative emission reduction techniques would be implemented.

Staff disagrees with the generalization that small shops cannot bear any liability for the quality of the finish. Through staff's field evaluations, staff identified small operations, including two shops (Acme Billiards and Penny Lane) discussed in the report that are very small operations that have made the switch to low-VOC coatings with great success. Staff believes that the current rule, which stands in tact, which includes an exemption for one gallon per day facilities, is equitable and the VOC limits are achievable for both small and large operations.

A socioeconomic analysis was included as part of the supporting documentation and approved by the Board when the Rule 1136 was amended on June 14, 1996. Furthermore, the rule allows compliance through low VOC formulations and enhanced transfer efficiency, or the use of add-on air pollution control equipment. Several companies have elected to use the add-on control equipment option.

Comment No. 5

With the increase in population of California the burden of air pollution reduction should be directed to automotive sources since they contribute 80% of the problem. My company has tried all waterborne formulations with limited success. Small coatings manufacturers simply cannot handle the volume required by this industry. Our competition is from the overseas market where regulation is nonexistent.

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Response

The SCAQMD, as an extreme ozone non-attainment area in the country, has the obligation to pursue the most stringent control achievable for stationary sources and aggressively pursue controls of mobile and area sources. AQMD rule include several that apply to mobile and area sources.

There are a number of other coating options to compliance that do not incorporate just waterborne finishing solutions. See Response to Comment No. 1.

APPENDIX E

COMMENTS RECEIVED AND RESPONSE TO COMMENTS

Comment Letter #1 – National Paint and Coatings Association

November 14, 2003

Lee/David:

RE: NPCA Comments on Draft Annual Report on Rule 1113

1-1

While we do not agree with the conclusion of the report --that compliant VOC AIM products that meet the Phase II and III limits are available for all applications and situations -- we would like to compliment you on the extent and breadth of this year's Annual Report to the Board. It definitely reflects a lot of effort by the district staff.

1-2

You already are aware of our position on the District's heavy reliance on information obtained from MSDS sheets and product technical data sheets. Therefore, no more said on that issue. But we are glad to see the District now includes specific documentation on the field visits to see the application of low VOC AIM products. One issue that troubles us is that all of the field visits were to sites where low VOC products were being applied or had recently been applied [in the last six to nine months]. The important fact that is missing here is what will these low VOC coatings look like after two or three years [or more] of exposure or service? This is particularly critical for the exterior applications. The long-term performance of a coating [i.e. service life] is key to the acceptability of that coating as an adequate substitute for higher VOC products. This question still remains unanswered until long-term durability can be shown.

1-3

Another point that is troublesome is that all field visits [and the coatings studies] cited in the report, concern the use and application coatings by professional painters either in an industrial [shop] setting or in the field. Between 40-45 % of AIM products are bought and applied in the "do it yourself" market. Some consideration must be given to how the average home owner will be able to handle the new low VOC products, particularly the two package or catalyzed materials that will be required in order to meet the new VOC limits for many of the categories in 2006 [e.g., floor coatings]. We suggest that the District examine the impact of the new limits on the DIY market if not in this report then in the next report.

1-4

On page eight of the report, it is stated that the staff has discussed possibility of conducting further testing for Nonflat-High Gloss coatings with members of the TAC. We would appreciate that the report reflect that NPCA has offered to work with the District on a independent competitive evaluation of AIM coatings aimed at addressing the industry's concerns over performance and long term durability of

low and ultra low VOC coatings. We are disappointed that the earlier discussions about the possible use of the Master Painters Institute, as the independent entity to conduct such tests, has not been fruitful but we agree that an open dialog must be maintained.

These are just a few of our thoughts on the Annual Report and we hope that you may be able to address them in the final report.

Thank you for providing an opportunity to comment on the report and we look forward to a continuing dialog on Rule 1113.

Sincerely,

Bob Nelson
National Paint and Coatings Association

- 1-1 Staff appreciates the commentators (National Paint & Coatings Association) acknowledgment of the amount of effort put forth by staff for completion of this comprehensive report and notes the disagreement with the conclusions. For each category studied under this particular annual status report and technology assessment, staff has determined that there are coatings available that meet the current and future limits as proposed in the rule and therefore disagrees with the commentator.
- 1-2 The material safety data sheets (MSDS) and product technical data sheets reviewed by staff contain actual test results as reported by manufacturers. As a consumer, one would rely on the information provided by the manufacturer, assume that it is correct in content and base decisions to utilize a specific product on that data. Staff has also assumed the data obtained is truthful in nature and does place much emphasis on the reliability of it. Similar VOC information has been provided by those same manufacturers to the California Air Resources Board as part of the 2001 CARB Survey and is a basis for comparison.

In response to the commentators point that the site inspections only include coatings "...applied [in the last six to nine months]", staff would ask that the NPCA review many of those reports again for content. At the time of the site visits that have been made available for public review, many had been in place for more than 18 months and some for up to seven years. Staff will also periodically monitor the sites as an on-going evaluation of performance. While there is a plethora of products available that meet the future limits with good performance characteristics, staff does not preclude the possibility of conducting additional testing on some of these products. Staff is looking forward to working closely with the TAC towards identifying candidate products for further testing.

- 1-3 The commentator is concerned that "all field visits[and the coatings studies] cited in the report, concern the use and application coatings by professional painters". Anyone that applies a coating and receives compensation for completion of a job can be considered a professional by any standard. The large percent of coating failures occur due to poor surface preparation that the typical do-it-yourself (DIY) consumer may avoid by taking the time to properly complete the job. District staff has personally seen "professional painters" complete entire residential exterior painting jobs in one afternoon only to have the coatings fail within one year due to poor surface preparation. Most consumer products are single component and the few categories that may have multiple component products that could potentially be used by the DIY market should not be problematic. Staff has reviewed and witnessed the required mixing process of many two and three component products and does not consider it to be problematic if similar products were to be made available to the DIY market. Staff requests the commentator to help devise a program to evaluate DIY painting projects.

1-4 Staff appreciates NPCA's willingness to work with the District on possible future coatings analysis and the comment has been incorporated into the report. The District is also committed to working with industry and maintaining an open forum on all discussions relative to Rule 1113, future VOC limits and additional studies.