Resolutions for the New Year

Last year I wrote my New Year's Resolutions editorial in the March *JPCL*. This year, I am making my resolutions before one quarter of the year is done! Of course, I want my family and myself to remain healthy and all of us to have a happy year in 2008. I am not asking for prosperity because without good health and happiness, all else is irrelevant. And I wish all our readers good health and happiness in the coming year.

Maybe my first resolution is to procrastinate less. I am usually very timely in my work, especially when there is a "suspense" date involved. But sometimes I wait until the "last gun is fired" to get more routine things done, and that habit puts undue pressure on me and subordinates, when they are involved. My daughter has a good saying for this trait: the "true deadline is the suspense." When I was in the Army, we had an unwritten rule that the upper-level headquarters had one-third of the total time to develop a plan and relay it to the subordinates. The subordinates would then have two-thirds of the time to accomplish what they had to do. I need to do a better job of keeping that rule in mind, and of understanding that the longer I wait, the harder it is for my subordinates to do their jobs.

My second resolution is for all our members to remember safety and follow through on one act every day to ensure that everyone goes home to their families without incident. I have written several editorials about safety and, to me, this is one of the most important responsibilities we have as leaders and to our fellow employees.

My next resolution is to try not to find fault so often. I sometimes feel that the glass is half empty and not half full, which those around me perceive as negative thinking. I could summarize this wish as a desire to have a more positive outlook. Along with that, I need to compliment people more often.

During the year, I will strive to learn something new every day. I was not hired at SSPC because of my coatings knowledge but for my skill as a manager. I have learned a lot during my tenure, but I feel I can do better both in managing and in learning more about the industry SSPC serves. I want to thank the members for their help in teaching me all that I have learned to this point about surface preparation and coatings, but I can always learn more.

During the holiday season, we heard a lot about having "peace on earth." My wish is that each and every one of us will do something so that we may have "peace with the earth." Maybe that is doing something as easy as planting a tree, not removing a healthy tree, recycling more, and using energy more efficiently.

These are my suggested resolutions. While they are not profound, I hope that you, the reader, will think of your own lives and the resolutions you want to embrace, not only for 2008, but also for the years to come. And lastly, I wish to thank all the members and our readers for a good 2007, both personally and on behalf of SSPC.

Bill

Bill Shoup
Executive Director, SSPC

PPG Names Mauck VP of Protective and Marine Coatings

Thomas S. Mauck, general manager, protective and marine coatings at PPG Industries, has been appointed vice president, protective and marine coatings. According to the company, Mr. Mauck joined PPG in 1980, working in several finance and accounting roles as well as corporate planning and development, before moving to the United Kingdom as zone manager, automotive refinish, in 1990. In 1993, he returned to PPG global headquarters as controller and business planning director for industrial coatings. In 1996, he was appointed market manager for coil and extrusion coatings products, and he was promoted to general manager, industrial finishes, in 1999, the company says. After being appointed director, raw material purchasing, in 2002, Mr. Mauck was named to his current position in 2006. Last year, Mr. Mauck led the integration of PPG's acquisition of Ameron Coatings, PPG reports.

PPG Industries, headquartered in Pittsburgh, PA, is a global supplier of paints, coatings, chemicals, optical products, specialty materials, glass and fiberglass to the industrial and marine coatings and other industries.

Thomas S. Mauck

Euclid Chemical Acquires Productos Cave S.A.–Chile

The Euclid Chemical Company of Cleveland, OH, has announced that it has acquired Productos Cave S.A., Santiago, Chile. Terms were not disclosed.

Productos Cave S.A., headquartered in Santiago, Chile, is a manufacturer of high-performance restoration, waterproofing and concrete admixture products for various segments of the concrete and masonry construction industry throughout Chile.

Kenneth W. Korach, President of Euclid Chemical said, "The acquisition of Productos Cave S.A. expands Euclid Chemical's current Latin American footprint to the Southern Cone of South America. The additional market, operational and managerial resources of Productos Cave S.A. complements the already established Euclid Chemical companies in Mexico, Colombia, and Central America."

The Euclid Chemical Company produces over 400 engineered concrete admixture and construction products marketed under the EUCO, EUCON, Tamms, Dural, Speed Crete and Hey'Di brand names. These products include concrete admixtures, block and masonry additives, curing and sealing compounds, epoxy adhesives, floor and wall coatings, structural grouts for columns, equipment and machinery, joint fillers, and repair products.

Polyguard Ownership Acquires DeNOVUS

Polyguard Products, Inc., of Ennis, TX, has announced that its ownership group has acquired the assets of DeNOVUS LLC from Orscheln Industries, of Moberly, MO. Terms of the acquisition were undisclosed.

DeNOVUS LLC consists of several technology-based startups, which sell anticorrosion and sealant products primarily to marine, oilfield, pipeline, highway, and industrial insulation markets.

Polyguard Products has been the exclusive distributor for several years of DeNOVUS' largest selling anti-corrosion product, a gel-like material called RG2400™ and known by users as Blue Goo™. The environmentally benign Blue Goo™ products are used in corrosion-control industrial applications such as under insulation, downhole drill casings, naval shipboard, and bridge structures.

According to Polyguard, a large amount of intellectual property comes with the acquisition. Blue Goo LLC of Texas, the company formed for this acquisition, has obtained ownership or royalty-free licenses on 95 patents, domestic and worldwide. These patents relate not only to the gel technology, but also to fusion-bond epoxies, high-temperature-resistant corrosion coatings, and high-strength corrosion coatings. Also, Polyguard says that several key inventors of the 95 patents will continue to work for the company at its laboratory in

Excelsior Springs, MO.

In commenting on the sale of DeNOVUS, Bob Orscheln, vice president of Orscheln Industries, said, "This deal allows Orscheln to focus on its core controls business (Orscheln Products) and further development of the corrosion resistant line of products (Elisha). Polyguard now has new products that fit nicely with its existing businesses. This transaction is a winner for both organizations."

Industry Mourns John Steinhauser, Bob Thompson

John C. Steinhauser, born April 27, 1939, in Chicago, IL, passed away on May 4, 2007, after battling chronic lymphocytic leukemia (CLL), according to an obituary notice in The Seattle Times.


John C. Steinhauser

He was diagnosed with CLL in 1990, and, despite his diagnosis, he continued to run regularly. Mr. Steinhauser incorporated his love for running and his battle with leukemia by participating in a half marathon in Alaska as part of The Leukemia & Lymphoma Society's® Team in Training, the notice said.

Mr. Steinhauser graduated from Stanford University in 1961 with a B.S. in chemistry. A long-time member of SSPC, he was active in the SSPC Surface Preparation and Hazardous Paint Removal and Disposal committees, and he chaired the SSPC committee that developed SSPC-TU 6, Chemical Stripping of Organic Coatings from Steel Structures, the Society reports.

He is survived by his wife, three daughters, twin sister, and extended family.

Axxiom Mfg.'s Bob Thompson also


Bob Thompson

passed away last year. Mr. Thompson, and the late Bob Schmidt, became partners and built a manufacturing facility in Fresno, TX, in 1983. He developed and patented many products used in the abrasive blasting industry, such as blasting pots, bulk blasting systems, the Thompson valve, Microvalve, and Combovalve, Axxiom reports.

According to Axxiom, Mr. Thompson was an art major in college. As he evolved through his professional life, he became a leader, business man, mentor, and father-figure to many. According to Axxiom, those who worked with him call his inventions 'simple genius.' Mr. Thompson will be remembered for his integrity, loyalty, and honesty, Axxiom says.

Vulcan Group Director Receives ASQ Certification

Cory A. Allen, director of quality systems at The Vulcan Group in Bessemer, AL, has completed the requirements for the American Society for Quality's Certified Six Sigma Green Belt (ASQ SSGB). The Certification Board of the American Society for Quality (ASQ) states that the recipient earns the designation through a demonstration of his understanding of and proficiency in Six Sigma principles and practices.


Cory A. Allen

"ASQ provides certification as a way to provide formal recognition to professionals who have demonstrated an understanding of, and a commitment to, quality techniques and practices in their job and career," said Mike Nichols, ASQ president. "This is a great accomplishment and, although not a formal registration or licensure, it represents a high level of peer recognition."

"We were happy to support Cory's pursuit of this achievement," says Vulcan Group president David Boyd. "This recognition helps to highlight our company's commitment to quality and employee training."

According to ASQ, since 1968, when its first certification examination was given, more than 100,000 individuals have become ASQ certified in their field or profession, including many of who have attained more than one designation. To learn more about ASQ's Certified Six Sigma Green Belt program, visit www.asq.org/certification/six-sigma-green-belt/.

Chief Chemist Named at SEI Chemical

SEI Chemical, a manufacturer of antigraffiti and other specialty coatings and additives, named Maurice A.S. Stephenson to the newly created position of chief chemist. Stephenson was formerly a polymer chemist at DuPont Co., and also has worked as a research scientist for several major corporations.

SEI Chemical, based in Los Angeles, CA, is a manufacturer of release, antimicrobial, anticorrosion, and anti-abrasion coatings. The company also manufactures resins, coupling agents, curing agents, coatings additives, sealants, and building-restoration products.

Repairing Polyureas

What is the most cost-effective way to repair elastomeric polyurea coatings when there is delamination after 1 year of service and the repair is expected to last 15 to 20 years?

Art Weiss, VersaFlex Incorporated

Polyurea is generally applied in multi-coat passes in order to build overall membrane thickness. Delamination of polyurea occurs when one coat of polyurea separates from underlying coats. Delamination is not the lack of bond between the polyurea coating and the substrate—that is a substrate preparation problem.

The potential for delamination in polyurea coatings is created at the time of initial application and may occur at one or many locations as stress causes one coat of the coating to separate from underlying coats.

The causes of delamination include when one coat of polyurea is sprayed over a partially cured under coat; when underlying coats of the polyurea are contaminated on their exposed surface by dirt, oil or moisture; or when the underlying or currently sprayed coat is off ratio. Most often, delamination will occur locally rather than generally and at areas of overlap of spray activity.

Because polyurea is a combination of an isocyanate and any number of amine-terminated resin compounds that build large molecular structures quickly, there is a small window of time when the compound is truly wet and one coat of polyurea will seamlessly crosslink and bond with a previously applied coat. Thus, additional coats must be applied before the cure cycle of previously applied coat prevents chemical crosslinking with following coats. Due to their chemical make-up, some polyureas, such as silicone-based formulations, are very intolerant of multi-coat applications. Aromatic polyether-ester-based polyurea formulations contain compounds that generally offer longer crosslink time relative to spray application. As a general rule, one coat must be sprayed over another within 2 to 4 hours after application of the first coat.

Overlaps must be specifically prepared to accept the next coat. The procedure for preparing previously sprayed polyurea for over coating is basically the same as for repairing delaminations.

Repair of delamination is time consuming, and thus costly. Any partially bonded or delaminated coating must be removed. The area of delamination (or the lap coat area) must be cleaned of contamination, scarified (roughened to increase mechanical adhesion), and then wiped liberally with a solvent that will cause the older coating to become tacky. When tacky, the underlying polyurea will exhibit the greatest number of available crosslink locations, which provides the highest intercoat bond. Readily available solvents that will make polyether-ester-based polyureas tacky are methyl ethyl ketone (MEK) and acetone. De-natured alcohol will work on relatively new base coats—those placed 4 to 8 hours previously. At that time, a further coat of polyurea may be applied. (While most epoxies will bond to polyurea, the use of a rigid bonding agent to glue one coat to another is not recommended, because follow-on stress will again form a plane of weakness, possibly causing further delamination over time.)

As to whether the repaired polyurea will last 15 to 20 years, that will be a function of care taken during repair. Properly specified and installed polyurea will last for many years, even decades. But the absolute time that polyurea will function is dependent on specific environmental and operating circumstances. Once evidence of faulty installation is present, there is very little hope that a repaired coating will last as long as a coating that had no installation defects.

Art Weiss, a technical supervisor at VersaFlex Incorporated of Kansas City, KS, has been involved in concrete construction and concrete repair and restoration since 1971. He has installed, supervised the installation of, and written specifications and procedures manuals for special coatings, expansion control, sealing of structural and architectural concrete elements, and corrosion control systems. In 1987, the Construction specifications Institute certified him as a Construction Specifier. He is a member of ACI, ICRI, SSPC, SWRI, and sits on several ACI Committees: TSC Technical Specifications Committee, 301 Specification for Concrete, and 515 Protective Systems for Concrete.

Upcoming Problem Solving Forum Question for February, 2008

What kinds of (generic) products and equipment are available for concrete and other surfaces that help with gum removal, which is a big problem for buildings in our school district? We have different types of floor coatings, bare concrete, sealed concrete, and bricks. Currently, we are using a hot box and a pressure washer. But this is limited and is destructive to some surfaces. Whatever we use for removal must not create slip and fall hazards, and VOC emissions must be avoided.

To submit a response, please contact Daryl Fleming, Assistant Editor, *JPCL*: dfleming@protectivecoatings.com.

Aircraft Carrier Sails through Tank Maintenance Project

In August 2006, the *USS Abraham Lincoln* aircraft carrier cruised into Puget Sound in Bremerton, WA, and docked in preparation for a massive tank blasting and coating project that was expected to take nearly six months to complete. Thanks in part to a sophisticated air distribution system and custom-built dessicant dehumidification systems, the carrier was ready to sail two weeks ahead of schedule. The Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF) completed ship tank maintenance in five months.

The *USS Abraham Lincoln*, based in Everett, WA, is the fifth Nimitz-class supercarrier in the U.S. Navy. The ship has a length of 1,092 ft (328 m) and a flight deck area comprised of 4.5 acres (18,211 m). It is powered by two nuclear power plants, features four engines, and has a displacement of 97,500 tons (88,451 metric tons). The ship has enough generating power to supply electricity to 100,000 homes, food and supplies to operate for 90 days, and the capability of distilling more than 400,000 gallons of fresh water from the sea each day.

A Nimitz-class supercarrier like the USS Abraham Lincoln.
Photos courtesy of the U.S. Navy

Potable Water Tanks Require Maintenance

The aircraft carrier's 16 drinking water tanks required blasting and coating due to corrosion caused by the failure of the existing epoxy polyamide coating system, says Randy Baisden, process manager for Shop 71 at the Puget Sound Naval Shipyard and preservation improvement initiative coordinator for Naval Sea Systems Command (NAVSEA). These tanks range in size from 1,500 to 4,500 sq ft (139 to 418 sq m). The project included abrasive blasting the inside surfaces of the tanks, cleaning out the abrasive and debris, and preparing a clean, dry surface for the application of the Mare Island Type 3 epoxy polyamide coating system (MIL-PRF-24441, Type 3).

The project required a design incorporating abrasive handling equipment to facilitate high-pressure blasting to remove the corrosion; dust collection systems to remove the airborne dust and debris from the blast work; humidity control to create a dry atmosphere inside the tanks to speed the drying of paint during application; and blowers to remove volatile fumes.

Meeting the project's timetable was critical. According to personnel at the military shipyard, a restrictive time frame for the project had to be met because a major ship like the Abraham Lincoln can only be out of service for a limited amount of time.

Innovative System Deployed

A few weeks after arriving in its home port of Naval Station Everett, the *USS Abraham Lincoln* was moved to Puget Sound Naval Shipyard so that the tank work and other maintenance projects could begin. In early September, 26 trucks delivered dehumidification, dust collection, and abrasive handling equipment. Navy personnel placed the equipment on the floor of the drydock underneath the carrier.

The equipment included sixteen 5,000- to 12,000-cfm dessiccant dehumidification units, 4 dust collectors, 16 blast machines, and 16 vacuums, says Baisden.

The shipyard designed the abrasive handling, dust collection, and dehumidification system, factoring in back-ups and fail safes, says Baisden. The shipyard purchased some of the equipment and worked with the dehumidification company to incorporate chilled water and steam heat into the dehu-

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midification units' design. These changes facilitate temperature regulation within the work area.

Containment Construction

Concurrent to the delivery and placement of the equipment, PSNS & IMF personnel built four temporary containment quadrants underneath the ship using pressure-treated, marine-grade plywood. Each quadrant measured approximately 70,000 sq ft (6,503 sq m), says Baisden. Enclosures also were built around each tank opening that had been cut to gain access to the work. Temporary, rigid ductwork was connected to the dehumidification and ventilation equipment and then fed into the containment areas. From the hard vent, PSNS & IMF personnel also placed ductwork into the tank enclosures.

Each containment quadrant was serviced simultaneously during the project. Four dehumidifiers were placed in each quadrant, with two units running constantly and two units connected and ready to operate in case of an unexpected equipment shut down.

Port and starboard sides of the work area were looped together with a ventilation and dehumidification system and then balanced to support all of the tanks in each quadrant. Emergency cross connects were utilized so that both sides of the work area could be kept operational in the event of a problem with any part of a quadrant's ventilation and dehumidification system. In such a case, the team could remove the cap from a cross connect and run flex ductwork to interconnect the quadrant to another system.

PSNS & IMF personnel also built prefabricated, smooth bore aluminum piping and ran the line all the way around the ship. Along the line workers installed small ports with valves for pumping air and exhaust into and out of each tank for dust collection and dehumidification purposes.

All set-up work was completed in early October. The air distribution system supplied cool, dry air to both the blasting and coating containment and also directly into the tanks where the work was being performed. The large enclosed areas underneath the ship provided the return air. This also provided personnel with the ability to cross over from port to starboard so that they could balance and adjust air flow to lower the dew point inside the tanks.

Throughout the project, PSNS & IMF personnel monitored the conditions on site. Air flow, ambient and substrate temperatures, relative humidity, and dew point were measured every four hours, and necessary adjustments were

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made to the system, says Baisden.

The dehumidifiers featured a touch panel display so that personnel could confirm that all of the critical performance parameters of the system were met. The project required humidity levels of 50% or less.

The USS Abraham Lincoln at its home port in Everett, WA

Surface Prep and Coating

The specification called for the preparation of the steel to an SSPC-SP 10, Near-White Blast Cleaning. Following abrasive blasting, workers applied the three-coat epoxy polyamide at 2 mils (50 microns) dry film thickness per coat, in addition to stripe coats.

According to Baisden, crews worked on four to five tanks at a time. “The painting was the longest leg of the project,” he says. By keeping the substrate temperature at 70 F (21 C) and the relative humidity less than 50%, the crews could apply the stripe coats and second and third coats of the system after cure times of 48 hours per coat.

The *USS Abraham Lincoln* left drydock at the shipyard ahead of schedule and under budget, saving the Navy hundreds of thousands of dollars in manpower and maintenance expenses. The project shattered the previous industry standard of completing six tanks in 101 days. “The guys got it done in five months, [working] seven days a week, 24 hours a day,” says Baisden of the nearly 180 shipyard workers responsible for the surface preparation and coatings application. “We lost 30 days on the front because the carrier was delayed. When it hit the blocks, we were two weeks behind schedule. When we finished, we were two weeks ahead of schedule.”

J.T. Systems, Inc. (Liverpool, NY) assisted with the design, development, and delivery of the equipment. Munters Corporation, Moisture Control Services Division (Glendale Heights, IL) supplied the desiccant dehumidification units. SAFE Systems, Inc. (Kent, WA) supplied the blast machines.

From Munters Corporation,
Moisture Control Services

A Sample of Coatings Research Around the World

The first protective coatings conference in Europe for several years, organized by the PRA in association with *JPCL* and co-sponsored by SSPC, was held recently in Amsterdam. Reflecting the global nature of the business, over 100 delegates from 18 countries attended the sessions, which covered new resin developments, functional technology, applications in service, and testing specifications.

New Resins Include High-Solids, Waterbornes, UV Curables

According to Udo Schiemann and his colleagues (Degussa) in their paper, "Novel High Solid Systems Based on Silicone-Epoxy Hybrid Resins," organo-silicone hybrid polymers have been developed that combine the properties of organic and inorganic compounds in a new class of binder. These binders are of increasing interest to industry due to their widespread applications. The organic component in the binder matrix offers the advantages of mechanical toughness and adhesion, while the inorganic compound provides the coating with its hardness, thermal resistance, and UV resistance. For improved compatibility and performance, it is necessary to react rather than dry-blend the two components. The authors describe how new primers and topcoats have been formulated on the basis of silicone-epoxy hybrid systems in isocyanate-free, two-pack coatings with outstanding weathering resistance, high chemical resistance, and VOCs levels below 100 g/l.

Dominique Vanderberge et al. (Hexion Speciality Chemicals) described the development of waterborne binder technologies over 30 years as one of the most important options to reach VOC-compliance ("Waterborne Epoxy Technology and Top Performance: No Longer a Fairy Tale?"). The authors highlighted the importance of 'formulation know-how' to achieve top performance in key market segments, such as transportation coatings and primers for the agriculture, earth-moving, and equipment markets. The authors' newest (4th generation) technology is based on an epoxy-amine dispersion binder consisting of a bisphenol-A solid epoxy resin and a hydrophobic amine adduct hardener pre-dispersed in water with a proprietary non-ionic surfactant. The authors describe how the new technology can be used to replace solvent-borne technology without sacrificing final performance, and they give suggested formulations and new end use areas for epoxies. However, the authors stress that the main challenge for formulators of waterborne systems is selecting the correct technology for the end use and mastering the involved formulation parameters.

In "Radiation Curable Protective Coatings: Innovative and Feasible Solutions for the Steel and Aluminium Industry," Marc Heylen (Cytec Surface Specialties) describes developments to tailor UV-curable systems for metal protection. Nowadays, UV-curing technology is well established for solvent-free coatings for wood and paper, printing inks, and electronic appliances. For metal substrates, however, UV-curable coatings have limited use because of inadequate corrosion resistance, flexibility, and adhesion. A study of the chemistry of coating resins shows that urethane backbones offer flexibility and adhesion, while epoxy backbones give corrosion resistance; hence, a portfolio of different chemistries have been developed for use in UV-cure coatings for metals. Combinations of the resins with a range of reactive diluents mean that the formulator can tailor a coating system according to the end use requirements.

In "Developments in Waterborne Acrylic Resins for Low VOC Industrial Maintenance Coatings," Andrew Trapani et

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al. (Rohm and Haas) described three relevant technologies based on waterborne acrylic emulsions: a resin designed for corrosion-resistant, direct-to-metal (DTM) coatings with VOC contents under 100 g/l; a self-cross-linking resin for clear coats to improve durability over pigmented base coats; and an elastomeric acrylic for use in thick-film (up to 500 μm), surface-tolerant coatings for steel and concrete with VOC below 50 g/l. Formulation and coating properties are given, and results are compared with both higher VOC waterborne and solvent-borne coatings.

Christian Bruchertseifer from Dow Deutschland described work carried out to improve the chemical resistance of hybrid elastomers ("Novel Polyurethane Spray Elastomers with Enhanced Chemical Resistance"). Over the past decade, spray-applied polyurea and polyurethane hybrid polymers have found rapid acceptance as protective coatings due to their high reactivity, speed of application, and mechanical strength. However, their performance in very aggressive envi-

More News about Coating Breakthroughs

Two recent articles report on advances in coatings, including the development of "smart" pigmentation that resists the absorption of solar radiation and the formulation of a modified sol-gel system for thin-film corrosion-resistant coatings.

Smart Pigments Offer Cool Benefits

Thermo-controlling pigments are the subject of Dr. Lutz Frischmann's (Heubach GmbH) article, "How To Turn Black to Cool," which appears in the October 2007 *Polymers Paint Color Journal* (*PPCJ*, pp. 22-26). These pigments, explains the author, reflect near infrared (NIR) radiation, a type of radiation that is absorbed by surfaces, causing them to build up heat. Thermo-controlling pigments in coating formulations can offer consumers an alternative to white and pastel coatings, while reducing heat build-up and subsequent energy consumption.

Frischmann discusses a spinel black pigment that reflects infrared radiation and testing that compared coatings formulated with this pigment and a carbon black-pigmented coating. The testing measured the build-up of heat in coated panels during exposure to artificial NIR light. The coatings formulated with the spinel black pigment showed significantly reduced surface temperature in comparison to that of the sample coated with the carbon black-pigmented coating.

When formulating infrared-reflecting coatings, the formulator should consider the infrared reflectance of the polymeric matrix. In selecting a pigment for formulating these coatings, the total solar reflectance (TSR) of the candidate materials must be compared. High TSR values, which indicate efficient solar reflectance of ultraviolet light, visible light, and NIR radiation, are desirable. Frischmann concludes by stating that mixed metal oxide pigments make good thermo-controlling pigments because of their high TSR value and their weathering and light fastness characteristics. In addition, the pigments offer a wide range of colors.

VOC-Free Coating Is Thin but Tough

Bjorn Borup, Burkhard Standke, and Christian Wabmer (Evonik DeGussa GmbH) describe thin-film corrosion-resistant coatings based on sol-gel technology in "Sol-Gel, VOC-Free: A ronments such as the chemical processing, power generation, and paper industries has been marginal and not as viable as current solutions based on, for example, epoxies and vinyl esters. The approach taken in this work was to create polyurea hybrids that incorporate hydroxy-terminated hydrocarbons or natural polyols derived from soy oils. The hydrocarbon modification provided a significant increase in hydrophobicity, resistance to chemical attack, and, to a lesser extent, thermal aging. The most significant change occured when both components were modified.

Coatings and Sealants for Concrete

Lars Wolff et al. (Insitute of Building Materials Research, Aachen University) discussed the causes and prevention of blistering of reactive resins on concrete. (See "Blistering of Reactive Resin Coatings on Concrete: Causes and Prevention," in the December 2007 *JPCL*.)

Karl-Heinz Kaesler (Momentive Performance Materials) described the use of water-based siloxanes as water

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Modular System Offers Versatile Thin-Film Metal Protection" (*European Coatings Journal*, November 2007, pp. 28-34).

The water-borne sol-gel system has a broader range of applications than solvent-borne sol-gel-derived metal coatings and pretreatment systems, which are not as stable in storage and require special application equipment. The coating is comprised of an acidic water-borne inorganic resin system. A neutralizing agent can adjust the pH of the coating for acid-sensitive substrates, and other components allow the formulation of hydrophobic and oleophobic coatings, the authors report.

Water-borne sol-gel systems with no volatile organic compounds (VOCs) form a hydrophobic surface barrier and reduce the ingress of water and chlorides. The coatings also improve the adhesion of another topcoat. In addition, the coating can react with a metal substrate, providing a passivating effect, the authors say.

Sol-gel coatings can be formulated as easily cleaned coatings and corrosion protective coatings. The authors discuss the application and curing requirements for these coatings, and describe three specific examples.

repellents for concrete surfaces. The siloxanes are breathable (vapor permeable) and reduce chloride penetration, thus reducing degradation of the concrete. The siloxanes meet the European highway authorities' requirements for bridges ("Siloxane: The Modern Way to Protect Concrete").

Curing Agents

Conventional high-solids polyamide technology for two-pack epoxies has become the industry standard for application in high-performance protective coatings. However, the limited recoat window after the first coat has become an increasing problem because of geography. For instance, steel primed in a shop but fabricated and topcoated far from the shop may need a recoat window of 3 to 6 months. In "Innovative Polyamide Technology Delivering Long Overcoat Window," Rob Rasing et al. (Air Products & Chemicals) described a modified polyamide solution of medium viscosity designed for liquid epoxy resins in two-component, ambient-cure coatings. Researchers compared a new metal primer based on the new technology against existing two-component technology; the new primer had the longer recoat window—of greater than 3 months—when overcoated with a two-pack epoxy or polyurethane.

Steven Block et al. (Dow Corning and Daikin Industries) described recent developments for coatings based on the synergistic effect obtained from the chemistry of silicone and fluorine materials ("New Chemistry Improves Surface Performance"). The introduction of hydrosilylation-cure technology to fluorine resins has significantly broadened the range of applications for fluoropolymer technology. The authors demonstrated that fast and low temperature cure (relative to what is normally required for a fluoropolymer cure) as well as hardness, flexibility, weatherability, chemical resistance, and adhesion are some of the key performance enhancements obtained with this technology.

Innovations in Other Raw Materials Reported

Presentations covering the use of other of raw materials for protective coatings included the use of a proprietary grade of talc (Juergen Spehn, Omya International, "Available Worldwide, but Locally Milled, Talc for Heavy-Duty Anti-Corrosion Primers").

Phenalkamine epoxy curing agents offer low VOC capability from a renewable resource, reported Jean-Luc Dallons of Cardolite Corporation ("Coating Vehicles with Green Chemistry").

Howard Jess of Luminous Technologies described the modification of coatings to enable easy inspection of large areas ("The Use of Optically Active Additives in the Protection and Preservation of Structures").

From David Mason of NGF Europe came a report on recent developments with glass flakes ("New Applications for Coatings Containing Glass Flakes").

The paper, "Phosphorous Rich Polymers and Mixed Intumescent Polymer Salts," addressed the development of novel intumescent coatings (David Aslin, Prometheus Developments), as did the paper by Claudio Pagella of Procoat ("New Driving Forces for Intumescent Coatings").

New Work on Salts, Corrosion Inhibitors

Nigel Whitehouse (PRA), in his paper, "Recent Progress in the Developments of International Standards for the Surface Preparation and Painting of Steelwork," included comments on the potential problem of proposals to set unrealistically low limits for chloride ion contamination.

The topic of salt contamination was picked up again in two papers that reported on detailed studies about how contaminated steel affects coatings applied over salts. Paul McBain, International Paint, presented "The Effect of Soluble Salt Contamination of Steel Substrates on the Performance of Coatings." Peter S. Longdon and Mallika Bohm of Corus gave the paper, "Soluble Salt Contamination on Blast Cleaned Surfaces and the Effect on the Durability of Subsequently Applied Coatings." One observation was that different coating systems can tolerate different levels of residual salt.

The topic of corrosion protection by inhibitors was the subject of two presentations.

Thomas Bedard (Lonza) described the

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development of a patented corrosion inhibitor based on a water-soluble quaternary ammonium compound, which at the right concentration forms a self-assembled monolayer on the steel surface ("A Multi-Metal Corrosion Inhibitor with Relevance to Commercial Surface Preparation and Coatings Technologies"). The positive results from electrochemical testing and salt spray testing of various generic systems were discussed.

Jurgen Scheerder et al. (DSM NeoResins) reported on research into exopolysaccharides (EPS), made by micro-organisms, for the protection of steel ("Exopolysaccharides (EPS) as Anti-Corrosive Additives for Coatings"). The initial EPS studied increased the water sensitivity of the primer resin and resulted in poor corrosion resistance; however, a modified EPS showed promise by increasing the corrosion protection obtained.

For and From the Field

Other presentations at the two-day event included the need for training of applicators, how to avoid disputes on coating projects (Andrew Briggs and Miles Robinson, Mayer, Brown, Rowe, and Maw, "Disputes in On-Shore Coatings Projects"), and health and safety issues (Dr. Philippe Legros, OCAS NV, "Coatings and Risk Assessment").

Developments in protection against high heat were reported by Adrian Andrews and Marie Halliday of International Paint ("A New Generation High Temperature Corrosion Resistant Coating").

Michael Melampy and Peter Bock of Hi-Temp Coatings Technology also described new technology for heat-resistant coatings ("Liquid-Applied Coatings for High-Temperature Corrosive Environments"). The coatings are designed to overcome the major problems with corrosion under insulation, where steel pipework can cycle up to extreme temperatures, beyond the capabilities of most conventional coatings.

A full set of the conference papers is available in CD and book format for £180 (PRA Members £130). To order a copy, please contact Janet Saraty or complete an order form online at www.pra-world.com.

Look for more reviews of coatings research at www.paintsquare.com.

If you have coatings research to report, send it to Karen Kapsanis, Editor, *JPCL*, 2100 Wharton St., Suite 310, Pittsburgh, PA 15203; kkapsanis@protectivecoatings.com; fax: 412-431-5428.

Rebar Coating Protects from the Outside In

A liquid galvanic coating applied to the exterior surface of concrete structures protects rebar from corrosion while offering easier application than metalizing, according to the developer of the technology, NASA's Kennedy Space Center Corrosion Technology Lab. The product, which NASA originally called Liquid Galvanic Coatings for Protection of Embedded Metals, may contain several types of metallic particles, such as aluminum, magnesium, zinc, and indium. Applied by conventional spray or brush to the exterior surface of the concrete, the coating provides sacrificial cathodic protection to the rebar as well as a barrier from moisture, chlorides, and acidic air contaminants for the concrete. Because it is applied to the concrete surface, the coating can be applied after construction and is accessible for repair, according to NASA.

Scaled-up test/demo reinforced concrete slabs for Liquid Applied Galvanic Coating
Courtesy of NASA

According to NASA, the initial technology report was submitted to NASA's John F. Kennedy's Space Center on June 4, 1998. Following further development and testing of the product, NASA filed a provisional patent in November 2000 and then a U.S. patent application on October 15, 2001. NASA was awarded a U.S. Patent for the product on September 30, 2003.

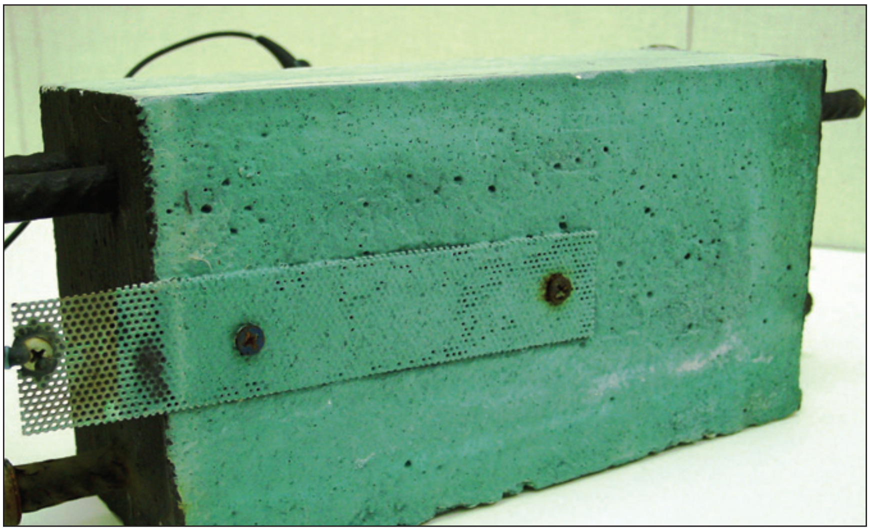
Benefits of the Coating

The chief benefits of the liquid galvanic coating system are the simplicity of its application and ease of repair, along with the sacrificial nature of its function, which does not require electrical power. Following testing to determine the continuity of the reinforcement, connection wires are attached to the concrete surface and the rebar. The liquid galvanic coating is applied by conventional spray, brush, or roller over the connection wires and the concrete surface.

Continued

How It Was Developed

Louis MacDowell III, chief of the Materials Test and Chemical Analysis Branch, and Joseph Curran, formerly of the Kennedy Space Center, developed the liquid galvanic coating. The Corrosion Technology Laboratory developed the technology as a potential solution to the problem of concrete cracking due to corroding reinforcing steel, according to an article by Carol Anne Dunn, project specialist/awards liaison officer of the Technology Programs and Partnerships Branch of NASA/John F. Kennedy Space Center. She points out that the Space Center is not immune to the problem of rebar corrosion, noting that the "Kennedy Space Center's two Shuttle launch sites each consist of 68,000 cubic yards of concrete weighing 1.3 million pounds."



Liquid Applied Galvanic Coating test/demo reinforced concrete block
(The green is the coating on the block, electrically connected to the reinforcing steel.)
Courtesy of NASA

Two Companies Receive License To Commercialize Product

NASA has nonexclusively licensed this liquid galvanic coating technology to two companies: Cortec Corporation (St. Paul, MN) and Surtreat Holding LLC (Pittsburgh, PA).

Cortec Commercializes the Coating

After further testing and improvements to the liquid galvanic coating, Cortec is marketing its product under the name of GalvaCorr®. According to Jessi Jackson Meyer, technical sales manager with the company, the four-component, moisture-cured, metal-rich urethane coating underwent significant formulation changes, due to concerns that the coating was not sufficiently conductive to halt rebar corrosion. Since altering the formulation, the company has applied for a co-patent with NASA on its improvements, she says.

Dashed lines show the locations of wire connections on the underside of the Maryland Avenue Bridge in St. Paul, MN. Photo courtesy of Cortec Corporation

Cortec recommends the coating for use on bridges, decks, ramps, and garages. According to Meyer, the surface preparation measures required for the coating consist of removing contaminants, dirt, and loose material from the concrete, which can often be accomplished by power washing. The concrete substrate must be dry to the touch before the coating is applied, and new concrete should undergo a 28-day cure before being coated. The coating can be applied with brushes, rollers, or spray equipment. The coating should be applied when temperatures are over 32 F (0 C) and in relative humidities between 40% and 85%. The company recommends applying 20 to 30 mils (500 to 750 microns) of the coating. A 12-hour cure is required.

The company has applied the coating in several ongoing trials. The oldest trial, the application of the coating to the underside of a 30-year-old bridge by the St. Paul, MN, traffic department, began in 2004. In 2005, the underside of half of another bridge in Jordan, MN, was coated with the product after concrete patching was performed. According to Meyer, the half that was coated with the moisture-cured metal-rich urethane is outperforming the uncoated half, where patches have begun to disbond and crack. Other trial applications of the product include a project in Australia and one at a Paris airport.

Although the company has made the liquid galvanic coating available commercially, it is still tweaking the formulation to ensure that it provides sufficient protection to the rebar to completely halt corrosion, says Meyer. She says that the company plans to strengthen its marketing efforts for the product by next year.

Surtreat Continues Testing

According to NASA, Surtreat was given an early opportunity through a Space Act agreement to test possible solutions, and the company provided the initial corrosion inhibiting chemical and concrete testing slabs to NASA to help test the new materials.

Pete Ault of Elzly Technology tests Surtreat's coating at the Naha military port. Photo courtesy of Surtreat Holding LLC

In January 2007, the company worked with the U.S. Army Corps of Engineers to select reinforced concrete structures to coat with the liquid galvanic coating at the Naha military port in Okinawa, Japan. Two ring girders that had showed concrete spalling and rusting rebar were coated, one with the liquid galvanic coating and one with the company's chemical corrosion inhibitor system. After approximately six months, Peter Ault of Elzly Technology Corporation inspected the test areas, and the liquid galvanic coating was found to have provided a small decrease in the corrosion rate of the rebar, according to his initial report. Conversely, the company's chemical corrosion inhibitor system performed better than the liquid galvanic coating, substantially reducing the corrosion of the reinforcing steel.

Based on these results, the inspection company recommends further study of the liquid galvanic coating to determine if it is a feasible technology for protecting reinforcing steel. Surtreat plans to adjust the formulation, says Max Merzlikin, manager. The company has a general agreement with the Army for continued testing, he adds.

A new construction causeway pier with architectural cast treatment to look like tree bark. Courtesy of Bob McMurdy

Concrete Bridge Durability: Extending the Performance Envelope with Coatings

Part 4: Taking the Durability Plunge

By Bob Kogler, Rampart LLC

This article is the fourth in a series focused on the potential for coatings applied to protect concrete bridge infrastructure. The first article appeared in the April 2007 *JPCL* and focused on defining the scope of the issue of concrete bridge infrastructure durability. The article outlined the large and growing number of concrete bridges and their increasing average age. In addition, evidence was presented indicating a continuing need for enhanced durability for many concrete bridges, and a potential solution that protective coatings offer. The second article appeared in the July 2007 *JPCL*. It focused on the current and recent efforts of several bridge owner agencies that are now pursuing coatings-based solutions to enhance concrete bridge durability through testing and field applications. The third article appeared in the October 2007 *JPCL* and detailed how coating materials and surface preparation technology have risen to meet the challenge of the need for enhanced concrete durability.

The fourth article will focus on issues associated with the impending demand for coatings for concrete. That is, the need for greater durability is established and is growing in acceptance within the bridge community; however, what steps are now necessary to bring the needs and solutions together in a practical manner? Specifically, the article will discuss aspects of coatings that may provide pathways to implementation, with value that complements the durability offered by protective coatings.

The Aesthetic Door is Open

With regard to concrete, aesthetics is booming. Architectural concrete applications, both finishes and cladding, are all the rage. Precasters have the ability to pigment, shape, and texture precast surfaces to provide built-in aesthetics to engineered concrete surfaces. The technology has become well accepted and has spawned a large and growing industry in the consumer, residential, and commercial sectors.

In addition, organizations such as PCI (The Precast Prestressed Concrete Institute) are even certifying precast plants as "architectural finish" capable. According to PCI, 118 precasters in the U.S. are certified to cast prestressed bridge components. Most of these plants do commercial work as well as bridge work. Of the 118, 27 are certified in applying an architectural finish to commercial precast concrete. Of the 27, 6 are also certified to cast architectural finished products for bridges.

From these numbers, it is apparent that the demand for aesthetically designed and attractive concrete finishes is still a minority piece of the overall market, and the bridge market in particular; however, these numbers do indicate that there is a small but growing demand for aesthetic value to complement structural concrete, even in the bridge market. Furthermore, a good percentage of the precasters that currently do bridge work are not entirely unfamiliar with aesthetic value-added treatments, and these treatments are obviously in demand in their commercial business.

Parallel to these offerings is the increasing public demand for enhanced aesthetic treatments for highway structures. A 2006 study and survey conducted by the National Cooperative Highway Research Program (NCHRP) indicated that 32% of states incorporate color into their highway traffic barriers, and 24% use veneers (i.e., architectural cladding) on their barriers. The NCHRP study was specifically focused on highway barriers, but as barriers are often the most publicly visible component of a bridge, the data are certainly significant. The NCHRP study reported a dramatic increase in public requests for aesthetic treatments to all visible highway structures, and some states have responded by beginning to develop aesthetic design guidelines.

Also reflective of this trend is the recent establishment of Context Sensitive Design as a "vital few" goal for the Federal Highway Administration's environmental program. Context-Sensitive Design (CSD) is an approach that places preservation of historic, scenic, natural environment, and other community values on an equal basis with mobility, safety, and economics. This approach certainly opens the door for a broader application of value-added aesthetic treatments for highly visible highway structures. It appears the time to take highway design beyond basic engineering requirements to a more sustainable, holistic approach has arrived.

Although the global aesthetic efforts and initiatives above can be reasonably considered recent developments, discussion and action involving high-performance coatings is conspicuously absent. Certainly, coatings are applied to concrete bridge structures for aesthetic purposes and have been for many years. In fact, aesthetic-driven applications far outweigh concrete bridge coating applications primarily for durability purposes.

Paul Vinik of the Florida Department of Transportation indicates that the demand for coatings on concrete highway structures has been increasing in recent years in his state, but that the increase is due almost solely to local public requests and efforts to improve the appearance of individual concrete structures in high visibility locations. Coatings are used to inhibit mold growth and dirt pickup, provide a desired textured finish (smooth or roughened), or assist in the fight against graffiti, but little to no focus has been put on evaluating and reporting the long-term performance of these applied materials.

Decorative painting and stone mosaics are two methods used to improve the appearance of concrete structures in high visibility locations. Courtesy of the Texas Department of Transportation

Tom Schwerdt of the Texas Department of Transportation reports a similar trend in the Lone Star State. "Historically and currently, a very large fraction of our concrete painting is for aesthetics, with decorative painting, anti-graffiti painting or both. We also achieve decorative effects with form liners, exposed aggregate, stone block, tinted concrete and some ceramic mosaics." He says that most concrete roadway slab, sidewalks, curbs, medians and rails are treated for durability using either linseed oil or a penetrating sealer (silane or siloxane), and epoxy coatings are sometimes used on bents and bent caps to protect bridge substructures.

At the very least, the evaluation of any complementary durability benefit provided by these aesthetic treatments should be documented and shared. It is quite likely that materials that satisfy the specific aesthetic need while also providing significant durability benefits are currently available on the market.

The coatings industry needs to become more visible and more involved in the discussion regarding architectural treatments for concrete bridges. This means that the industrial coating sector must become more knowledgeable of the dynamic nature of the commercial and even consumer concrete market, since this will no doubt be the source of value-added technical innovation in the industrial sector via the technology transfer pathway.

Risk Management

One term that appears almost daily in the mainstream press is risk management. Of course, most of these references are on the business page and refer directly to the ongoing credit crunch fueled by the volatile subprime mortgage market. However, there is much to the collective discussion of risk management that can be applied to the management of industrial infrastructure and, specifically, to bridge durability. One fatal flaw illuminated by the current credit crisis is our collective cultural orientation toward median, or average-based thinking. That is, in most disciplines, we have been culturally oriented to view situations and data sets from the point of view of average performance rather than the extreme value scenarios (worst case) that are occurring today. Even our concepts focused on significant quality improvement begin at the median performance value and move up toward a higher probability of success as defined by a number of standard deviations, e.g., 3-sigma or 6-sigma, etc. This point of view has become institutionalized in our perception of quality and the goals we attempt to reach for in design and construction.

Interestingly, however, this point of view is not necessarily healthy when discussing risk management for our infrastructure. For in risk management, it is the singular, rare, but possible failure whose consequences can outweigh all previous real or assumed savings or efficiency gains achieved through average and probabilistic thinking. In more practical terms, it is not acceptable to claim success in our business by citing the fact that we've only had a handful of failures over hundreds of thousands of applications. That is, three failures out of 1 million computer chips or automobile power-adjustable seat motors may be acceptable, but three bridge collapses out of 1 million bridges in the system is not acceptable, particularly when it is clear that discrete, conscious resource decisions during the lifecycle of the structure can be cited as contributing to the cause of failure.

> **"The coatings industry needs to become more visible and more involved in the discussion regarding architectural treatments for concrete bridges."**

In addition, the discussion in our industry must focus not only on catastrophic risk but also on the growing risk associated with increasing cost and system downtime incurred during repair and replacement of deteriorated structures. This risk has not been properly quantified or modeled to date, but it is the risk of literally shutting down the highway system for repairs due to unnecessary, and totally avoidable corrosion that should be in the forefront of our collective decision making.

Moreover, in the specific case of corrosion of prestressed concrete bridges, we must change our thinking from the average-based approach to an extreme value approach. Virtually all of the research and analysis performed regarding concrete bridge corrosion over the past 30 years has taken this average-based approach. Datasets are generated and analyzed, and, for the most part, average corrosion rates are reported for the various test conditions. "Outliers" are thrown out or averaged out in the analysis rather than focused on as a possible reflection of a high risk combination of variables.

When analyzing the low strength, mild steel rebar applications that have been the most frequent focus of past (and current) corrosion studies, perhaps this average-based approach is not inappropriate. However, when moving the discussion to the more critical, higher-strength application of corrosion of prestressing strand, an extreme value approach must be used. It is not the average corrosion pit that snaps the strand due to stress-corrosion effects: it is the deepest and fastest growing pit—general or average corrosion rates are of no real value. This extreme value approach to corrosion and durability analysis has been applied by other industries in the past (e.g., power plant condenser tubes, critical content storage tanks), but not to bridge deterioration. Due to the unique nature of the corrosion failure mode of high strength prestressing strand (versus rebar) a shift in our collective point of view is necessary.

Risk management is a growing science and philosophy that is directly applicable to our business—infrastructure durability. Implementation of this way of doing business will require serious work in terms of data collection, cost and performance analysis and real time tracking of the performance of systems as applied in the field. But just as critical will be a shift in the mindset of infrastructure decision makers from the tried and true "cost/benefit" philosophy to a fail-safe mentality that the public expects and deserves.

Stone block is another decorative effect used to improve the aesthetics of concrete.
Courtesy of the Texas Department of Transportation

Future Direction

The previous articles in this series have addressed the growing need for extended durability, the growing enthusiasm of a select group of owners toward coatings as a potential complementary solution, and the availability of technology. The remaining hurdles barring widespread implementation of coatings for protection of concrete bridge surfaces lie primarily in the lack of a mobilized industrial base focused on concrete coatings and the lack of knowledge and sophistication in this area among owners, contractors, and even suppliers. Much of the lack of interest and knowledge makes sense given the small number of concrete bridge coatings jobs relative to the size of the market. Of the 400,000 concrete highway bridges, how many are coated, and of those, how many of these are coated primarily for aesthetics rather than durability?

The ongoing virtual renaissance of concrete appearance initiatives seems to have left value-added coatings by the wayside in favor of material- and technique-based solutions that reside solely in the current world of the concrete artisan/technician. The coatings industry has apparently not established a foothold with the precast industry as have the manufacturers of the various value-added concrete mix additive manufacturers. In addition, it is apparent that the stigma of "paint" as a perpetual, cyclic maintenance burden and cost is deeply embedded into the culture of the concrete industry. Breaking down this myth of poor performance will be a difficult, but essential job of the industrial coatings community over the next several years, and development of credible and accessible performance data will be the key factor in changing long established and widely held attitudes toward protective coatings technology.

The development process for consensus standards should, and often does, lead naturally to intra-industry technology transfer. The community that exists within the bridge coatings industry has never been stronger or more mobilized. In addition, the role of SSPC as an agent of technology transfer has never been more clear. The work left to be done includes the following.

- Aggressive gathering and collation of existing qualitative and quantitative data and results of both positive and negative experiences with regard to concrete coatings applications
- Establishment of a knowledge base to serve as a resource to owners and specifiers
- Development of consensus definitions for high priority issues and obstacles that must be overcome for implementation
- Organized, cooperative efforts to overcome obstacles as defined

One glaring obstacle to implementation of concrete bridge coatings is the lack of an established industrial base of contractors and technologists focused on this industry segment. Establishing this base is controversial, with a very large and established effort from the mainstream concrete industry pushing back, primarily portraying the negative aspects of coatings as costly, time consuming, and burdensome from a maintenance standpoint. The concrete industry has provided technology alternatives that also promise increased durability for structures without the use of coatings. It falls on the coatings industry to work closely and cooperatively with the prestress precasters to develop coatings-based solutions that add durability while adding value. At the same time, solutions must minimize the impacts on costs and delivery schedule that are often associated with protective coatings. To be successful, the relationship between the coatings and prestress precast industries must become akin to the relationship now shared between coatings manufacturers and steel fabrication shops.

Bob Kogler is a principal with Rampart LLC. Previously with the Federal Highway Administration, he led the agency's corrosion protection and coatings research efforts for the past decade. In his last assignment at FHWA, Mr. Kogler led the development effort of the Bridge of the Future research team aimed at making bridges that can be built faster and last longer. He is also a recent past president of SSPC. He can be reached at bob.kogler@mindspring.com.

NSBA Prize Bridge Winners Announced

The National Steel Bridge Alliance (NSBA; Chicago, IL) has announced the winners of the 2007 Prize Bridge Awards, which recognize significant and innovative steel bridges constructed within the U.S. The bridge awards are divided into seven categories, and the bridges are judged on their innovation, aesthetics, and cost-effective design and engineering solutions.

NSBA presented the awards at its biannual World Steel Symposium, held December 4-7, 2007, in New Orleans, LA.

The award-winning bridges are described below. When available at press time, the firms responsible for painting work on the bridges are identified, along with other firms involved in the design and construction of the bridges. All photographs in these pages have been provided by the NSBA.

Short Span: U.S.-36 over Box Elder Creek Bridge in Watkins, CO, is an innovative six-span bridge that is 470 ft (141 m) long and 44 ft (13 m) wide. The two-lane bridge is constructed of weathering steel and a cast-in-place concrete deck. The challenge of the project was designing a bridge that would meet the requirement for a shallow superstructure for the highway's low crossing at Box Elder Creek.

- Owner: Colorado Department of Transportation
- General Contractor and Steel Erector: Structural, Inc., Englewood, CO
- Steel Detailer, Project Design and Construction Engineering, and Designer: Colorado Department of Transportation
- Steel Fabricator: Big R Manufacturing, LLC, Greeley, CO

Medium Span: The I-94 Modified Tied Arch Bridge in Taylor, MI, otherwise known as the Gateway Bridges, replaces a four-span structure and carries the westbound and southbound traffic of I-94 over a re-designed Single Point Urban Interchange. The structures are twin single-span inclined through arches measuring 246 ft (74 m). The interior and exterior arch ribs are inclined 25 degrees towards each other, and the ribs are braced together using five football-shaped braces.

- Owner: Michigan Department of Transportation
- General Contractor: C.A. Hull, Inc., Walled Lake, MI
- Designer: Alfred Benesch & Company, Lansing, MI
- Steel Fabricator and Shop Painter: PDM Bridge, Eau Claire, WI
- Steel Erector: Whaley Steel Corporation, Mio, MI
- Painting Subcontractor: Progress Companies, Romulus, MI
- Coating Manufacturer: Carboline Company, St. Louis, MO

Major Span: U.S. 93 Burro Creek Canyon Bridge NB, between Phoenix, AZ, and Las Vegas, NV, is a weathering steel truss arch bridge designed as an expansion to the first Burro Creek Canyon Bridge. The project addressed the U.S. Bureau of Land Management's concerns for preserving the canyon and difficulties posed by the construction of the steel arch over the canyon.

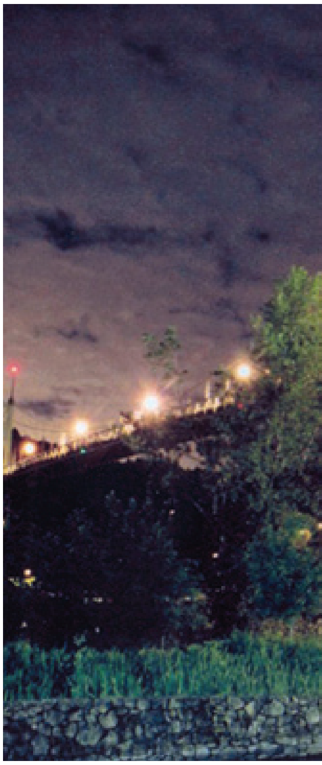
- Owner: Arizona Department of Transportation
- General Contractor: R.E. Monks, Fountain Hills, AZ
- Construction Consultant: Parsons Brinckerhoff Construction Services, Inc., Phoenix, AZ
- Consultant: URS, Phoenix, AZ
- Designer: Arizona Department of Transportation
- Steel Fabricator: PDM Bridge, Eau Claire, WI
- Steel Erector: Traylor Brothers, Irvine, CA
- Blasting Consultant: Saguaro GeoServices, Tucson, AZ
- Landscape Architecture: Logan Simpson Design, Tempe, AZ

Long Span: Raccoon Creek Bridge in Pike County, KY, is part of U.S. Route 119. The Bridge consists of twin four-span structures that are 1,275 ft (383 m) long. Three piers ranging from 140 to 210 ft (42 to 63 m) tall support each bridge. Project challenges included the need for constructing long spans, limitations on available workspace, the 200-foot (60-meter) height of the bridge, and the weight of the box girder segments. Weathering steel girders were chosen to simplify maintenance by eliminating the need for future closures for bridge painting.

- Owner: Kentucky Transportation Cabinet
- General Contractor and Steel Erector: Bush & Burchett, Allen, KY
- Designer: Palmer Engineering, Winchester, KY
- Steel Fabricator: High Steel Structures, Inc., Lancaster, PA
- Steel Detailer: Tensor Engineering Co, Indian Harbour Beach, FL

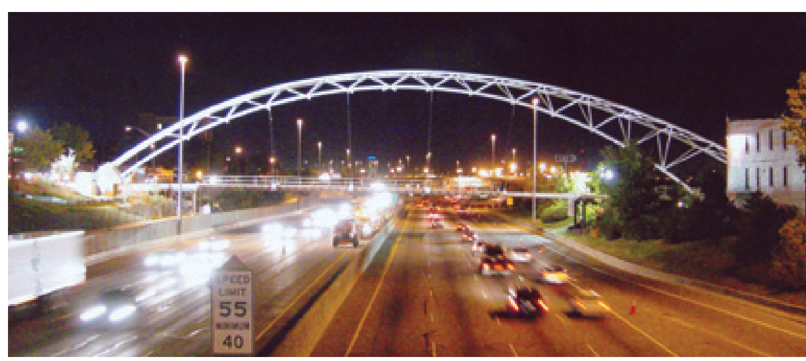
Movable Span: Intracoastal Waterway Bridge at Louisa, LA, is Louisiana's longest steel girder double-leaf bascule bridge. The new bascule span is a narrow two-lane structure (20 ft by 276 ft [12 by 84 m]) that provides a minimum vertical clearance in the closed position of 73 ft (22 m) and a horizontal navigation clearance of 200 ft (61 m). A major aesthetic consideration for the project was to design the movable bridge to contain the counterweight and machinery without introducing any noticeable visual obstacles.

- Owner: Louisiana Department of Transportation and Development
- General Contractor: Coastal Bridge Co., LLC, Baton Rouge, LA
- Designer: HNTB Corporation, Baton Rouge, LA
- Steel Fabrictor: Carolina Steel Corporation, Greensboro, NC
- Steel Erector: Huval & Associates, Inc., Lafayette, LA
- Movable Span and Machinery Fabricator: Steward Machine Co., Inc., Birmingham, AL
- Painting Subcontractor: Hames Painting Contractors, Atlanta, GA
- Coating Manufacturer: Sherwin-Williams, Cleveland, OH



Reconstructed: The St. Johns Bridge in Portland, OR (below, left), is a historic 3,600-foot (1,080-meter) suspension bridge that spans the Willamette River in Portland, OR. The $37 million project included restoration of deteriorated steel, installation of a new deck, painting, main cable rehabilitation, suspender replacement, railing installation, and seismic retrofitting.

- Owner: Oregon Department of Transportation
- General Contractor and Steel Erector: Max J. Kuney Construction, Inc., Spokane, WA
- Designer: OBEC Consulting Engineers, Eugene, OR
- Steel Fabricator and Steel Detailer: Hogan Fabrication, Inc., Portland, OR
- Consultant: Jim Strasky, Consulting Engineer, Greenbrae, CA
- Suspension Cable Ropes and Fittings: Houston Structures, Inc., Hubbard, OR
- Traction Rod Castings: Atlas Casting and Technology, Chehalis, WA
- Traction Rod Fuses and Cable Band Bolts: Portland Bolt & Manufacturing Company, Inc., Portland, OR
- Painting Subcontractor: Long Painting Company, Portland, OR, with work subbed to S&K Painting, Portland, OR
- Coating Manufacturer: Sherwin-Williams, Cleveland, OH



Special Purpose: The Highland Bridge in Denver, CO (above), is a pedestrian bridge that links lower downtown Denver to the Highland neighborhood northeast of Denver. Extending across I-25, the bridge utilizes structural steel tubing and a cable stay system in its design. The triple-rib steel arch spans 320 ft (160 m), and the flared cross-hanger arrangement provides a sweeping support system for the suspended bridge deck.

- Owner: City and County of Denver, CO
- General Contractor: Hamon Constructors, Inc., Denver, CO
- Designer: Carter & Burgess, Denver, CO
- Steel Detailer: GES Tech Group – Construction Engineering, Calahan, CO
- Steel Fabricator: King Fabrication, Houston, TX
- Construction Oversight: Colorado Department of Transportation, Region 6
- Consultant: Hartwig & Associates, Englewood, CO
- Subconsultants: Clanton & Associates, Inc., Boulder, CO; and Tsiouvaras Simmons Holderness Inc., Greenwood Village, CO

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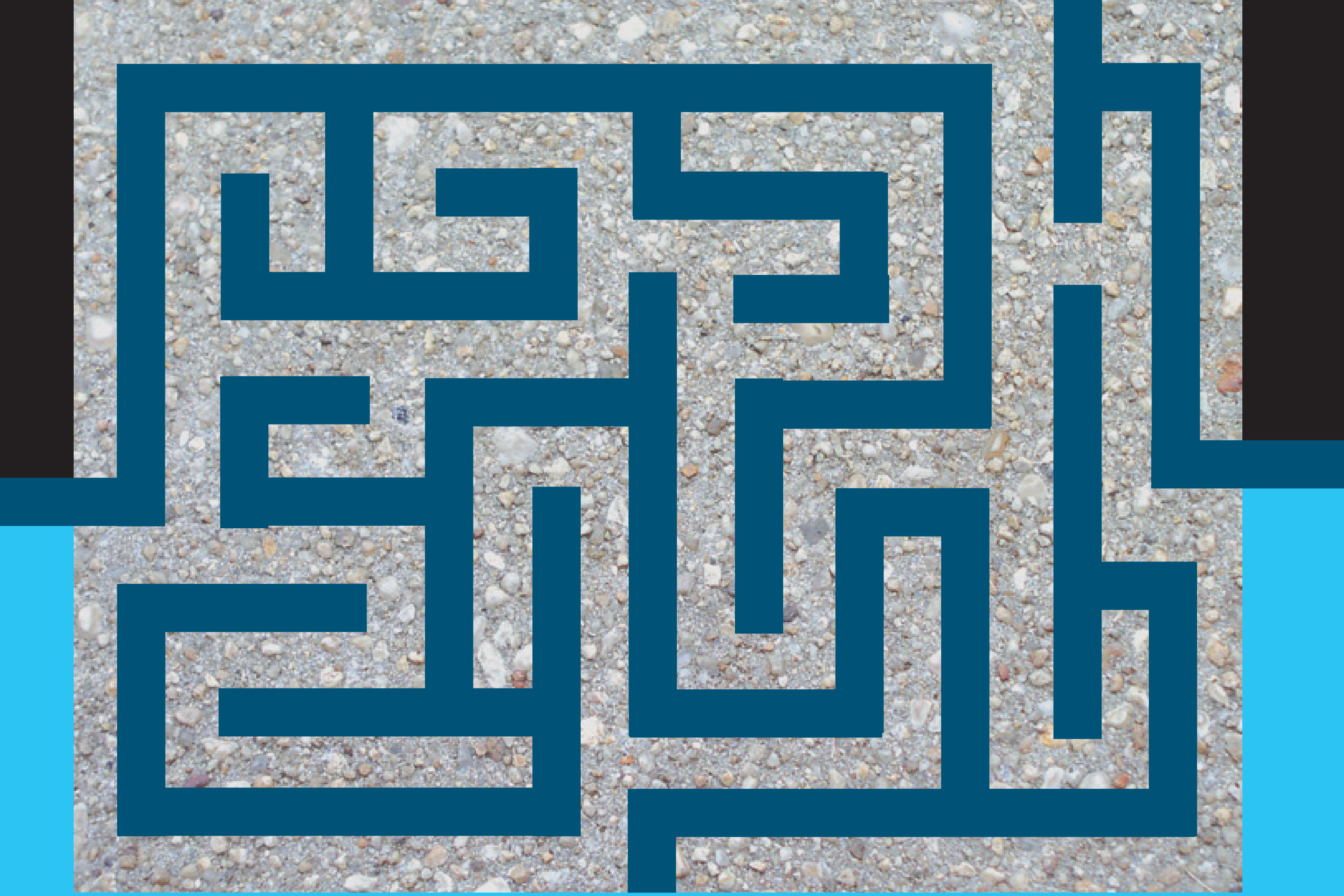

VARIABLES AFFECTING CALCIUM CHLORIDE TESTING FOR MOISTURE IN CONCRETE

It is widely accepted that moisture vapor transmission through concrete floor slabs can adversely affect the performance of coatings that are applied to the concrete slab. Before the early 1990s, it was common to check for moisture vapor transmission (MVT) through a concrete slab using either the plastic sheet method or any of a number of contact probes that were available for testing moisture. The plastic sheet method was strictly a qualitative test. A plastic sheet was taped to the bare floor, and the underside of the plastic sheet was later examined to determine whether moisture had condensed on the sheet. If moisture was found on the back of the sheet, it was assumed that the MVT through the concrete was too great for the successful application of coatings to the concrete slab.

The moisture contact probes usually work by measuring the conductivity between two points in the concrete. The probe correlated the conductivity of the concrete to the moisture content and typically had a range that was considered safe for coating.

Another MVT test was commonly used in the resilient flooring industry. This method was known as the calcium chloride test. The test, believed to have originated in the 1950s, was designed to quantitatively determine the rate of MVT through a concrete floor slab. ASTM International officially approved a calcium chloride test method in 1998 under the designation ASTM F 1869, “Measuring Moisture Vapor Emissions Rate of Concrete Subfloor Using

Editor’s Note: This article is based on a paper given at PACE 2007, the joint conference of SSPC: The Society for Protective Coatings and the Painting and Decorating Contractors of America. The conference was in Dallas, TX, February 11-14. The article is published with permission.

FOR ONE THING, CONTRARY TO POPULAR BELIEF, MOISTURE VAPOR FOLLOWS COMPLICATED ROUTES IN AND OUT OF CONCRETE

By Rick A. Huntley, KTA-Tator, Inc., Pittsburgh, Pennsylvania

Anhydrous Calcium Chloride."

The calcium chloride MVT test has steadily gained acceptance in the floor coating industry. This article discusses variables that affect the results of MVT testing with calcium chloride, and it presents the results of testing designed to measure the affects of certain environmental parameters on the results of calcium chloride MVT testing.

Concrete panel used for the calcium chloride test. Photos courtesy of the author

BACKGROUND

In the calcium chloride test method, a dish of dried anhydrous calcium chloride is weighed and placed on the floor where the moisture vapor transmission rate is to be measured. The method requires that if a floor coating has already been applied to the concrete, the coating must be removed from an area at least 20 in. x 20 in. A sealant is then applied to the flange of a transparent plastic covering, and the covering is placed over the calcium chloride dish. The dish is allowed to remain for 60 to 72 hours. The dish is then removed and re-weighed. The weight gain is assumed to be the result of moisture absorbed by the calcium chloride.

The MVT rate is then calculated based on the area under the transparent plastic covering (minus the area of the dish), the weight gain of the calcium chloride, and the exposure time. The MVT rate is expressed in pounds per 1,000 ft^2 per 24 hours. It is commonly held that the maximum MVT rate acceptable for application of coatings is 3 lb/1,000 sq ft/per 24 hours, although permissible rates can vary, depending on the coating manufacturer's specific requirements.

CALCIUM CHLORIDE TEST VARIABLES

The calcium chloride test is based on the assumption that moisture absorbed by anhydrous calcium chloride in a dish on the surface of the concrete slab originated either under a concrete floor slab and migrated through the slab to the surface from directly below, or within the concrete slab itself. In reality, moisture vapor will travel randomly in any direction. As a result, moisture vapor in the air above a concrete floor can travel into a concrete slab. Once moisture is in the concrete, it is reasonable to expect that the moisture can then travel horizontally. Given this expectation, one would further expect that some moisture absorbed by the calcium chloride originated in the air surrounding the transparent plastic covering the dish. The amount of moisture absorbed would increase as temperature and relative humidity increase.

Porosity of the concrete near the surface would also affect the absorption rate, because migration through the concrete would increase as the porosity increased. ASTM Standard Test Method F 1869 provides no limitations on the temperature and relative humidity of the environment surrounding the calcium chloride test apparatus if the conditions approximate the normal operating service environment. The test method simply suggests that the test site should be at the same temperature and humidity expected during normal use. If the temperature and humidity cannot be controlled to the range expected during normal use, the test method requires that the temperature be 65 F to 85 F, and the relative humidity should be 40% to 60%.

When an impermeable coating is applied to a concrete floor, no significant amount of moisture can migrate from the concrete to the air above, nor from the air above to the concrete. The moisture, though, can migrate horizontally under the floor coating. The calcium chloride test method allows testing to be conducted on previously coated floors in areas where a minimum 20 in. x 20 in. square of coating has been removed. Because the moisture in the surrounding areas around the 20 in. x 20 in. square of removed coating cannot migrate vertically through the impermeable coating, it is a reasonable assumption that some quantity of the moisture will migrate horizontally into the area where the coating has been removed, creating a kind of "chimney effect" (a type of moisture migration, defined below) and possibly biasing the results of the calcium chloride test.

MVT TESTING

In order to determine the effect of the various variables on the calcium chloride moisture test results, two test protocols were developed. The first test protocol was developed to assess the chimney effect, or moisture migration from areas of the concrete slab covered by an impermeable floor coating to areas where the floor coating has been removed to perform MVT testing.

The testing was conducted in a large facility that had been recently constructed with concrete floors and a self-leveling 100% solids epoxy floor coating system. The facility was near completion, and the HVAC system was operational. Four test locations were chosen within the facility. In each of the four test areas, the self-leveling epoxy floor coating was removed from a 24 in. x 24 in. area, which is somewhat larger than the 20 in. x 20 in. minimum area required by the test method.

Table 1: Moisture Testing Before and After Full Coating System Removal

Test Area	Full Coating Removal MVT (lb/1000 sq ft/24 hours)	24" X 24" Coating Removal MVT (lb/1000 sq ft/24 hours)	% Increase
Area 1	1.32	3.04	130%
Area 2	1.82	3.63	99%
Area 3	3.97	10.91	175%
Area 4	2.48	4.48	95%

Approximately 24 hours after the coating was removed, a pre-weighed dish of calcium chloride was placed in each test area and covered with a transparent plastic covering. The transparent plastic covering had a sealant applied around the flange and the sealant was firmly pressed into the concrete to form an airtight seal. After approximately 70.5 hours, the plastic covering was removed, and the plastic dish with the calcium chloride was reweighed.

Concrete test panel in an environmental chamber

After completion of the calcium chloride testing, all of the floor coating was removed from the facility due to technical problems with the coating (not necessarily associated with excessive moisture). The temperature and humidity within the facility were maintained at approximately the same level by the HVAC system. One week after the floor coating was removed, the calcium chloride test was again performed in the same areas at which it had previously been performed. The calcium chloride dishes were allowed to remain in place for 69 hours. The dishes were then removed and reweighed, and the MVT rate was calculated in accordance with the requirements of ASTM F 1869. Table 1 compares the results of the calcium chloride moisture testing on the floor that had contact coating with a 24 in. x 24 in. area removed, and the calcium chloride moisture testing performed where no coating remained on the floor.

The results in Table 1 demonstrate that there was a significant difference between the MVT rate measured in areas where a 24 in. x 24 in. square of coating was removed, and the same area after all of the coating was removed.

Table 2: Moisture Vapor Transmission Testing on Concrete Paving Blocks

Test Panel	Temperature (°F)	Relative Humidity (%)	MVT (lb/1000 sq ft/24 hours)
Panel 1	90	95	19.39
Panel 2	75	50	14.86

Table 3: Moisture Vapor Transmission Testing on Poured Concrete Panels

Test Panel	Temperature (°F)	Relative Humidity (%)	MVT (lb/1000 sq ft/24 hours)
Panel 3	75	50	3.22
Panel 4	90	95	5.12
Panel 5*	75	50	3.01
Panel 6	55	70	1.82
Panel 7	75	70	3.47

**Testing repeated at same temperature and humidity as Panel 3*

The second test protocol involved measuring the MVT rate using the calcium chloride test on concrete test panels. Two sets of concrete test panels were used. The first set was 16 in. x 16 in. x 2 in. commercially available concrete paving blocks. The second set was 12 in. x 12 in. x 1.5 in. poured concrete panels of normal weight. All of the panels were completely sealed on the bottom side and on the edges with approximately 15 mils of an amine-cured epoxy. The panels were sealed to prevent moisture migration through the bottoms and the sides. The tops of the panels were lightly abrasive blast cleaned to remove laitance, but left uncoated. The design of the panels allowed for moisture migration through the tops of the panels only, while preventing moisture migration from the bottom and the sides.

The calcium chloride test was performed on each panel while the panels were exposed to various conditions of temperature and humidity. The panels were stored for at least 24 hours at 70 F and 50% relative humidity before the calcium chloride test was performed. Once the calcium chloride test apparatus was attached to the panels, the panels were placed in an environmental chamber. The temperature and humidity were varied to determine their effect on the amount of moisture that could migrate through the top of the test panels.

The first testing was performed on the commercially available concrete paving blocks. Although the blocks appeared to be normal weight for concrete, there was some visible porosity in the surface. Table 2 presents the results of the MVT testing on the concrete paving blocks.

As can be seen from Table 2, the MVT rate through the top of the relatively porous concrete paving block was considerable, leading to MVT rate measurements much greater than 3.0 lb/1000 sq ft/24 hours, the maximum level generally considered acceptable for coating application to a concrete floor. These high MVT rate measurements were observed despite the fact that the backs of the panels were completely sealed, and no significant moisture vapor could have migrated through the concrete from the bottom.

The rest of the testing was performed on 12 in. x 12 in. poured concrete panels of normal weight. All the panels were coated on the top and sides, and the top of the panels were lightly abrasive blast cleaned to remove laitance. Table 3 presents the findings from MVT rate testing on the poured concrete test panels of normal weight.

As can be seen from Table 3, the measured MVT varied considerably and appeared to increase significantly with increases in humidity and temperature. It is interesting to note that the measured values were all greater than the maximum value of 3.0 lb/1000 sq ft/24 hours considered acceptable for application of floor coatings.

CONCLUSIONS

The calcium chloride MVT testing performed in this research indicate that the results are significantly affected by the humidity and temperature of the surrounding air, and they vary considerably depending on whether the testing is performed on a bare concrete floor, or on a coated floor where a small area of the floor coating has been removed. The testing has shown that measured moisture vapor transmission rates obtained from testing on a large area of bare concrete can be less than half the measured moisture vapor transmission rate in the same area when only a 24 in. x 24 in. area of coating has been removed. Moisture from surrounding areas of the concrete slab likely migrates horizontally through the slab and to the calcium chloride moisture testing site.

Based on these results, it is likely that the measured MVT rate obtained using the calcium chloride test before application of a floor coating will be considerably lower than the MVT rate obtained after the coating has been installed and sections of the coating are removed for testing. Thus, unfortunately, when assessing a floor coating failure, you may not be able to determine what the MVT rate was—as measured by the calcium test—before the coating was installed. So knowing whether the coating was applied over "dry" concrete might not be possible.

The research also suggests that much of the moisture detected by the calcium chloride test did not migrate through the slab but instead migrated into the concrete from the surrounding air and migrated around the flange of the plastic cover. The research further revealed that the amount of moisture that enters into the concrete from the surrounding air increases with increased temperature and humidity. The moisture migration through the top of the slab is sufficient to produce MVT test results higher than the maximum of 3.0 lb/1000 sq ft/24 hours recommended by many floor coating manufacturers. Under higher humidity and temperature conditions, MVT test results may unnecessarily delay application of a floor coating, even when very little moisture vapor is migrating through the slab. Under these conditions, the plastic sheet method or relative humidity testing may be more appropriate.

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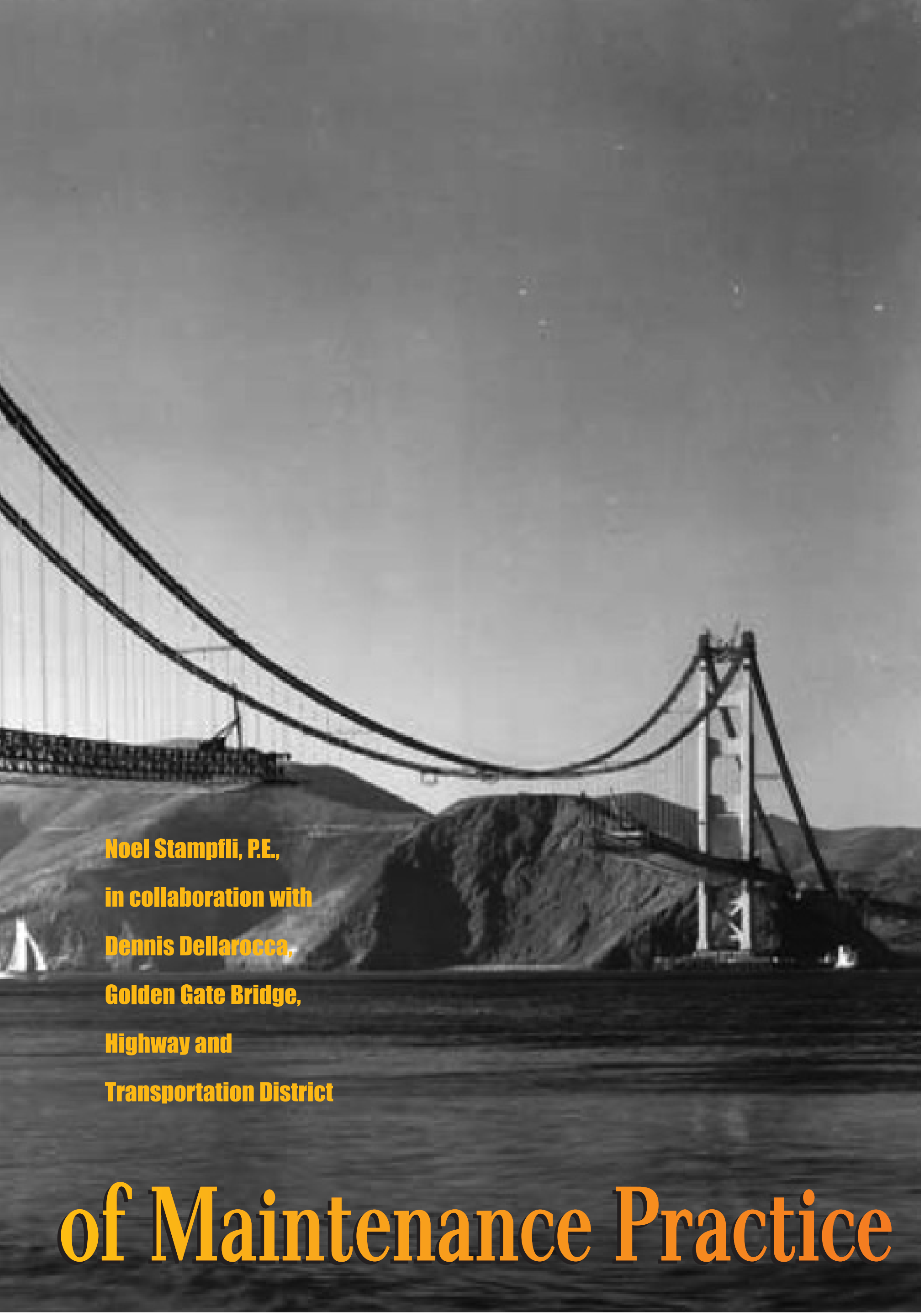
The Golden Gate: A History

Since completion of construction in 1937, the Golden Gate Bridge has had the distinction, among civil engineering works, of being an icon recognizable the world over.

In its 71st year, it remains the quintessential symbol of achievement and American know-how. Its distinctive "International Orange" color blends with land, sea, and sky in its spectacular setting as a gateway to both the Western United States and to the Pacific Rim.

Contrary to popular belief, the Golden Gate Bridge is not within the jurisdiction of the California Department of Transportation, although the bridge is part of the National Highway System. The bridge is owned and operated by the Golden Gate Bridge, Highway and Transportation District, an entity created by the California legislature to fund, construct, and operate the bridge. The District is comprised of the counties of San Francisco, Marin, Sonoma, Napa, Mendocino, and Del Norte. Today, the bridge carries approximately 41 million vehicles per year. In addition to the Bridge, the District owns and operates both a bus and ferry system serving the North San Francisco Bay Area.

Significant modifications have been made to the bridge in its first 71 years. The suspenders were replaced in the 1970s. The deck was replaced in the 1980s and an ongoing comprehensive seismic retrofit, was begun in the 1990s after the Loma Prieta Earthquake. This



Noel Stampfli, P.E.,
in collaboration with
Dennis Dellarocca,
Golden Gate Bridge,
Highway and
Transportation District

# of Maintenance Practice

(Immediate left): Golden Gate Bridge under construction in the 1930s
Photos courtesy of the Golden Gate Bridge, Highway, and Transportation District and the authors

(Facing page, far left): The Golden Gate Bridge on its 50th anniversary in 1987

article discusses the past and present of maintenance performed directly by the District's full time maintenance organization.

History

Original Coatings

The 1937 report of the bridge's Chief Engineer,[1] Joseph Strauss, provides details on the structural steel painting practice used during the bridge's construction. Fabrication of bridge steel occurred primarily in the Bethlehem Steel yards in Pottstown and Bethlehem, Pennsylvania (Figs. 1 and 2). Fabricated components were then shipped through the Panama Canal to the Bethlehem Steel yard in Alameda, CA, which is across the San Francisco Bay and the job site. The shop coating initially specified for application to fabricated steel was typical of the practice in the early 1930s: a single coat of paint composed of 25 pounds of red lead to each gallon of linseed oil. Applied directly over mill scale, the system was used on the steel for both of the suspension bridge towers and a portion of the suspended structure.

Strauss's report notes that shortly after fabrication of members for the suspended structure began, specifications relative to

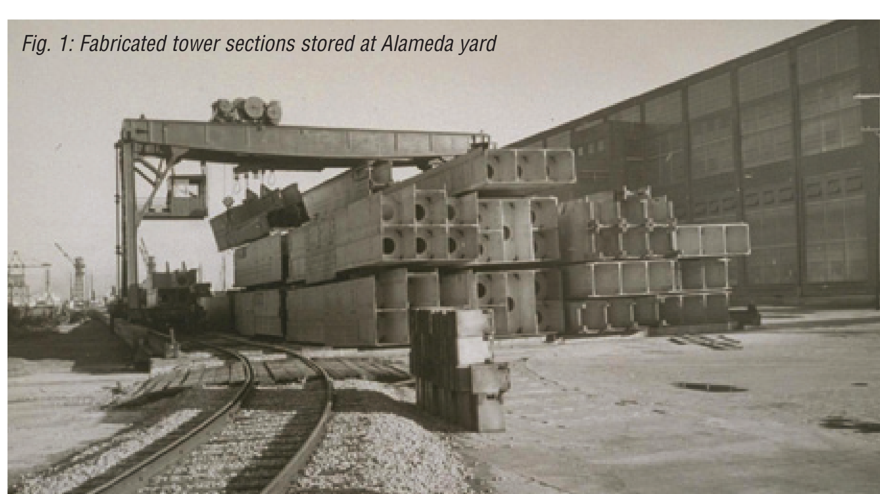


Fig. 1: Fabricated tower sections stored at Alameda yard

Fig. 2: Tower cornice section on rail car

Attempts were made to repair the failures, and the primed sections were touched up after erection and topcoated with alkyd linseed oil enamel in the distinctive International Orange color selected by consulting architect, Irving Morrow. The contract price for applying the final finish coat on the entire suspended structure and the approaches was $102,131.

The elements continued to work on the coating system after the bridge opened in 1937; it was realized quickly that significant future liabilities due to corrosion were inevitable. Maintenance painting began immediately. In his Annual Report for 1938-39 to the Bridge Districts Board,[2,3] Joseph Strauss identified the corrosion mechanism as the loosening of the mill scale that had allowed rust to progress beneath and noted that it was necessary to remove most of the paint and thoroughly clean the steel prior to repainting. This work, which culminated in the repainting of the San Francisco Tower and significant portions of the suspended structure, lost impetus when the U.S. entered World War II in 1941. A maintenance painting program suited for the challenge would not be re-instituted until the 1960s.

paint and painting procedure were completely revised. This was done to provide improved performance over that of the original system, which had not performed satisfactorily, as evidenced by failure before erection. The new specification required from one to three coats of paint comprised of 32% synthetic vehicle and 68% red lead. The new system was to be applied after approximately 50% of the steel for the suspended structure had been fabricated but stored unpainted. Consequently, this material developed a heavy coating of rust and the scale had become loose over large areas.

Strauss noted that "The work of cleaning the members, therefore, became a major operation, in fact it involved more labor than did the actual work of applying the paint." This statement provides insight into the way in which the industry in that day viewed the importance of proper surface preparation. It would seem that it was viewed as a costly consequence of leaving steel outdoors unpainted rather than as an integral part of an effective coating system.

Surface preparation in the shop consisted of a solvent wash, mechanical brush cleaning, an air blast, and, finally, a second solvent wash. Once shipped to the site, fabricated material with both the original and revised primers showed the effects of coating failure and widespread corrosion due to exposure to the marine environment during shipping and storage.

Fig. 3: On-site coatings test rack, 1937

Fig. 4: Thirty-year-old zinc primer specimens

The 30-Year Effort

In the years before WWII, the Bridge District had continually experimented with, and tested, new coatings products as they became available (Fig. 3). Evaluation of materials was difficult due to a number of variables, most significantly, the exposure to the elements and a lack of standards to evaluate long-term performance. In the early 1960s the District undertook a research program in conjunction with the Steel Structures Painting Council (SSPC, now the Society for Protective Coatings) and the International Bridge, Tunnel and Turnpike Association (IBTTA) to identify optimal materials for restoration of the structure. Coatings manufacturers were invited to submit their products and participate in the testing.

Several rounds of tests were conducted in which both topcoated and untopcoated primers were applied to both selected bridge members and mocked up test specimens that were located in areas of the bridge with the harshest exposure (Fig. 4). The test specimens were observed for up to several years. From the testing, it was concluded that inorganic zinc silicate primers applied over a Near-White abrasive blast-cleaned surface (SSPC-SP 10) would provide the level of corrosion protection appropriate for renovation of the bridge. From 1970 to 1995, in-house bridge crews removed essentially all previously applied paint systems from the bridge by abrasive blasting to a Near-

White condition and applied new paint systems consisting of inorganic zinc silicate primers that had performed satisfactorily in field tests, followed by alkyd, vinyl, and, finally, acrylic topcoats. The composition of the primers and both the composition and generic type of the topcoats varied as VOC regulations evolved.

Modern Maintenance Painting

Inspection and Planning

Most of the inorganic zinc systems applied during the 30-year effort to replace the original corrosion protection are intact today.

Major components of the bridge that were renovated at the beginning of the 30-year maintenance cycle, such as the South Tower and South Approach Viaduct, are programmed for repainting within the next 10 years. Maintenance practice today consists primarily of addressing areas of the bridge where regular inspection has indicated the need to perform structural repairs and renew corrosion protection locally. The bridge is inspected biannually in accordance with Federal Highway Administration (FHWA) guidelines. This inspection is performed by in-house engineering staff with assistance from in-house maintenance personnel. The inspection is sufficiently detailed to record the condition of every member, including connections and the coatings.

From the inspection worksheets, the individual member conditions are compiled into a spreadsheet that summarizes the condition of all bridge members in order of panel point. These summary spreadsheets can be color-coded to assist planning and to provide insight into trends and trouble areas. The suspension bridge towers, main cables, suspenders, anchorages, and concrete components are treated separately.

Maintenance projects for the suspended structure are identified and prioritized using the condition summary and other factors. Generally, priorities for repairs are assigned based on the severity of an area's condition. Fracture critical components such as floor beams are considered as a higher priority while other members such as secondary lateral bracing are considered a lower priority. Consideration is also given to the degree to which a given component can tolerate longer maintenance intervals. Examples of such components are suspender sockets, which are maintenance critical on the Golden Gate as they are on many older suspension bridges. Funding, availability of access, specific repair/recoating strategy, conflict with other projects, and weather cycles are also considered at this stage.

Resources

The Golden Gate Bridge has 9,150 feet of roadway. The suspension bridge makes up 6,450 feet of this distance, with the remaining 2,700 feet divided between the approaches, which are themselves steel truss spans supported on steel towers, a steel arch span, and the roof of the concrete North Anchorage Housing. The Bridge District maintains a full time force of approximately 75 painters, ironworkers, and operating engineers who are directly involved in structural maintenance. This group is divided into five paint crews, two ironworker repair/rigging crews, one ironworker shop fabrication crew, and one operating engineer crew. Access to the sides and underside of the suspended structure is achieved by pairs of permanent, diesel-powered, traveling scaffolds. There are a single pair on each sidespan and two pair on the center span.

These travelers were extremely useful for historic maintenance involving open air abrasive blasting. They remain well suited for inspection and small scale spot repairs but have proven less than optimal for larger scale repairs using economically practical containments for abrasive blasting.

Scheduling

With specific projects identified and prioritized as described above, the manpower and equipment resources are allocated onto a relatively simple long-term schedule that is the basis for a strategic maintenance plan. Typically, the maintenance schedule will look ahead at least four years. Project durations are estimated by management and updated quarterly to reflect progress. All paint crews are assigned a specific, prioritized sequence of projects. The ironworker crews are each assigned to support specific paint crews on those projects. Scheduling at this level, which is neither too detailed nor broad, allows the in-house organization to plan effectively and stay focused on mid- to long-term priorities. The maintenance schedule also tracks the bridge capital improvement program, which includes major projects such as the phased seismic retrofit. These large capital projects are typically contracted out; hence, maintenance projects are coordinated to avoid conflict.

Current and Planned Maintenance Projects

The following major projects are currently included in the maintenance painting program. Two of these projects are selected for further discussion.

- North Viaduct Restoration: Repainting of support towers, orthotropic deck and superstructure of 1,100-foot-long approach viaduct. Tower painting complete in fall 2006. Procurement and installation of access in progress. Superstructure work scheduled for Spring 2008.
- Span 2 Floor Beams: Restoration of selected 90-foot-long transverse beams on suspension bridge. Preparation using both abrasive blasting and ultra-high-pressure water jetting. In progress.
- Suspender Ropes: Overcoating of 1,000 suspender cables using both manual and automated methods for preparation and painting with elastomeric acrylic. In progress.
- Spot Repairs: Repair and re-coating of localized damage throughout the suspension bridge predominantly using power tools for surface preparation and mois-

ture-cured urethane coatings. In progress.

• South Tower: Re-coating of 746-foot-high suspension bridge tower. Coatings and access evaluation in progress. Scheduled start: fall 2008.

• South Approach Restoration: Repair and repainting of orthotropic deck and superstructure of 1,200-foot-long approach viaduct. Scheduled start: late 2007.

Case Studies

Floor Beams

Detailed biannual inspection is effective in revealing trouble spots in the highly repetitive framing of the suspended structure. One such area consists of the 90-foot-long transverse floor beams that support the roadway deck. These beams formerly supported a stringer system and cast-in-place concrete deck that was replaced by an orthotropic deck in the early 1980s due to corrosion of the stringers. The orthotropic deck consists of flat steel plates reinforced beneath by welded steel stiffening elements and overlaid with a thin wearing course of epoxy asphalt. The beams are 8 ft 6 in. deep and built up out of riveted plates and angles typical of construction in the 1930s. Due to their location beneath roadway joints, their shape, and the way buffeting winds beneath the deck carry roadway drainage, coatings breakdown and corrosion damage tend to concentrate and accelerate at the beam's lower flanges, cover plates, and web stiffeners. This damage is most severe at plate edges, at crevices, and on fasteners. The existing paint system is an inorganic zinc silicate primer with either vinyl or alkyd topcoats. Due to the condition, abrasive blasting was selected as the appropriate means of cleaning up damage to facilitate repairs and as surface preparation for repainting.

Access to the work is provided by the inner traveling scaffold, which spans the entire width of the deck and length of the beams. The scaffolds are well suited for localized contained blasting operations and are equipped with permanent ducting, fans, and filtration.

Opaque, cable-supported, flexible containment fabric is rigged from the scaffold deck to the underside of the orthotropic deck. The initial blast removes all failed coating and corrosion product. The ironworker crew then performs repairs that consist mainly of replacing damaged rivets with high-strength bolts. Upon completion of repairs, the surface is abrasive blasted to a Near-White (SSPC-SP 10) condition. Adjacent areas of sound coatings are Brush-Off (SSPC-SP 7) blasted to promote adhesion of an overcoat. A three-coat, moisture-cured urethane overcoating system is specified, which includes a zinc-rich primer applied directly to metal. Typically, it takes an average of 4 weeks to complete the above procedure, including erection and removal of containment.

To increase production, the District has looked to other technologies for the repair

Fig. 5: UHP waterjetting containment Fig. 6 (top right): Waterjetting equipment staging

work, namely ultra-high-pressure water jetting. Initially this was a challenge due to lack of space to stage the equipment on the bridge deck. Although a self-contained, trailer-mounted unit could fit tightly on one of the bridge sidewalks, it would not leave room for pedestrians and cyclists on the east sidewalk, which is open to the public. Nor would it allow passage of maintenance forces and equipment on the west sidewalk, which is used exclusively for maintenance operations during daytime. Staging the equipment in a closed traffic lane is also problematic because traffic demand requires all bridge lanes to be open for all but 2 or 3 hours during weekdays. For these reasons, floor beams on the Marin back span of the suspension bridge were selected. This 1,100-

Fig. 7: Initial condition of floor beam

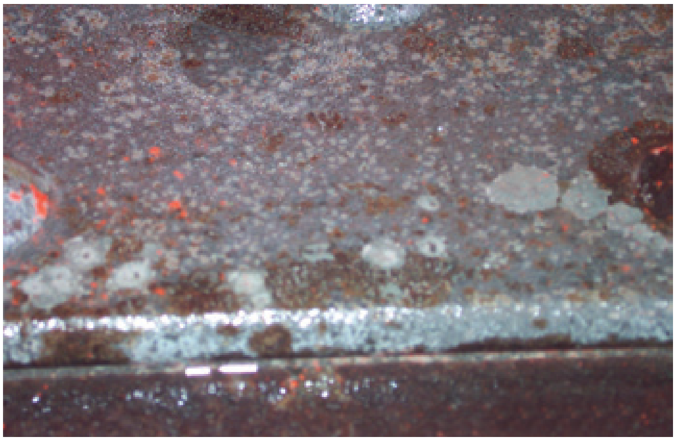


Fig. 8: Closeup after waterjetting

foot section of the suspended structure is largely accessible from the ground, where a hillside was locally removed during construction to allow clearance for the structure.

Project criteria called for water jetting to SSPC-WJ 2, with water collection followed by application of a three-coat, moisture-cured urethane system. As with abrasive blasting, the inner traveling scaffold afforded ideal access to the work and was easily rigged for water containment (Figs. 5 and 6). The solid floor of the platform (80 ft by 15 ft) was covered with polyethlylene sheeting, which was run up and over the handrails on all four sides. A drain was installed in the lowest spot. A geotextile that consisted of a filter fabric bonded to a plastic mesh was installed over the waterproofing. This material allowed capture of debris on the surface of the filter fabric while the water, carrying only minimal suspended material, was free to drain beneath the fabric and flow to the drain. A second layer of filter fabric was installed over the geotextile which could be removed and replaced as debris accumulated during jetting. Water passing to the drain flowed by gravity through a 2-inch hose to trailer-mounted water tanks on the ground below. Water was then hauled by land, over the bridge for treatment and disposal at the bridge maintenance facility.

Two production runs, each two weeks long, used 40,000 psi diesel-powered equipment (Figs. 7, 8, and 9). The shape of the floor beams, consisting of flat accessible surfaces, lent itself well to water jetting. Bridge painters dried jetted surfaces with compressed air immediately behind the jetting operation and applied zinc-rich, moisture-cured urethane primer the same day. Visible flash rusting was held to a minimum in this manner. Following primer application, the scaffold was moved to the next beam. On average, 2 beams were blasted and primed per week. Once 4 beams were completed, the scaffold was turned over to an ironworker crew for repairs and fastener replacement on each beam. When repairs were complete, the scaffold was turned back over to the paint crew to touch up the primer and complete application of the three-coat, moisture-cured urethane system. This procedure on average resulted in the renovation of 4 floor beams in six weeks. This productivity compares favorably with the same operation taking 4 weeks for a single beam using fully contained abrasive blasting.

Fig. 9: Waterjetting in progress

Suspender Ropes

There are 1,000 individual suspender ropes in 250 groups of four on the Golden Gate Bridge. Suspenders vary in length from 15 ft to about 500 ft. As it has on other suspension bridges, maintainability of suspender rope sockets proved critical on the Golden Gate (Figs. 10 and 11). The arrangement of stiffening elements at the suspender anchorages on the bridge stiffening trusses limited access for maintenance of the sockets. This condition resulted in corrosion of a number of sus-

Fig. 10 (top): Suspender Socket
Fig. 11 (below): Restored Socket

Fig. 12: Painters inside clamshell

Fig. 13: Automated painting tool

pender ropes at their interface with the socket castings, which, in turn, resulted in replacement of all suspenders on the Golden Gate in the mid 1970s. Suspender anchorage points were reconstructed to allow future maintenance. Wire for the new ropes was specified with a heavy, class 3 zinc coating and each rope was topcoated with a vinyl system after erection. The topcoat did not perform well on this challenging surface and the suspenders were topcoated again with a silicon alkyd in the mid 1980s.

Bi-annual inspection revealed limited coatings failure and minor corrosion damage to several ropes at the casting interfaces in 2000. A three-phase approach to suspender recoating was devised to address the most critical areas first. Phase 1 addressed the anchorage area. Phase 2 is addressing the section where the ropes pass over the main cables. Phase 3, which is concurrent with Phase 2, includes re-coating of the suspenders from the main cable down to the stiffening truss at roadway level.

Bridge outer traveling scaffolds were immediately modified with folding planks to allow personnel access to the suspender anchorage area. Three of the five bridge paint crews were assigned to recoat all suspenders from the point where they penetrate the top chord of the stiffening truss down to, and including, the anchorage points. An elastomeric acrylic was selected. The crews were careful to avoid accumulation of coating at the interface of the rope and its socket. Coating accumulation was avoided to allow moisture from void spaces to drain within the length of rope above. This first phase of suspender rope recoating took approximately 30 months.

Phase 3 started in 2005 and is still underway. Two methods are being used.

One method uses a "clamshell," which has been employed for earlier suspender recoating operations. It consists of a rigid enclosure equipped with two hoists. It is hauled up a suspender group and has a crew of two painters (Fig. 12).

Preparation is performed manually, with hand and power tool methods, including water wash. The elastomeric acrylic coating, followed by a high-performance acrylic topcoat, is applied by brush. One paint crew can man two clamshells. This method is used for the 32 longest of the suspenders, closest to the towers, which are equipped with intermediate cable separators. These separators control vibration in the cables and keep them from impacting each other when it's windy.

The cable separators preclude use of the second method, which involves a proprietary, automated cleaning and painting system deployed on the bridge in fall 2006 (Fig. 13). The system consists of several tools, the first of which is hauled by winch up each rope to mechanically remove poorly adhered existing coating and to abrade sound coating. A second tool, used similarly, pressure washes at approximately 2,000 psi and spray applies the elastomeric coating system. The tools provide containment for cleaning and painting operations. Inspection is performed from an aerial basket.

Besides inspection and relocating rigging from suspender group to suspender group, all cleaning and painting operations are performed from the sidewalk using a handheld controller. At the onset, this technology promises both comparable quality and significant labor savings compared to the traditional method.

Conclusion

Working on the Golden Gate Bridge is both a challenge and a privilege. Today's generation of stewards have many reasons to thank the previous generation of the bridge's workers. The research into effective coating systems and the commitment to see through major coatings programs in the past has made today's challenge manageable. It remains for those today to continue innovation and stay committed to the long-term preservation of the bridge. This article is dedicated to all of the Golden Gate's extended family: past, present, and, of course, future.

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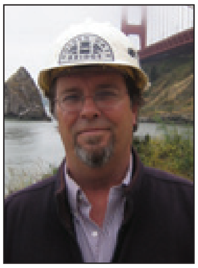
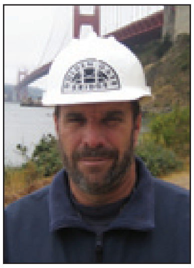
Noel Stampfli, P.E., is the maintenance engineer for the Golden Gate Bridge. His responsibilities include planning, scheduling, specifying, and coordinating structural maintenance. He has been with the Bridge District since 1985 and served as a construction engineer and capital project manager on a variety of bridge and



transportation projects for 15 years prior to assuming his current position in 2000. Noel came to the bridge from Bechtel Power Corp. where he worked in both structural design and as a resident engineer in the nuclear power industry. He received his B.S. Degree in Civil Engineering from the University of California at Berkeley, has been a Registered Professional Engineer in California since 1983 and a member of SSPC since 2001.



Dennis Dellarocca is the Paint Superintendent at the Golden Gate Bridge in San Francisco, California. In this capacity, he is responsible for the maintenance painting of the bridge and all the facilities at the toll plaza. Mr. Dellarocca oversees a workforce of 43 employees including chief bridge painters, bridge painters, bridge painter apprentices, paint laborers, chief house painter, house painters, and the sign shop. He has worked on bridges for the last 32 years in the San Francisco Bay Area. He has worked for CALTRANS for 10 years and at the Golden Gate Bridge for the last 22 years. Mr. Dellarocca has been a member of SSPC since 1997.

VOC Regulations for Coatings: A Review and a Look Forward

Regulations for industrial maintenance coatings, including specialty types, have changed in some areas over the past two years while the national Environmental Protection Rule (EPA) for them remains the standard for a majority of states. Changes to the South Coast Air Quality Management District's rule took effect in 2007, and several states belonging to the Northeast Ozone Transport Commission (OTC) have joined their fellow states in adopting the model rule that the OTC set forth in 2003. The OTC model rule essentially mirrors that of the 2003 model rule of the California Air Resources Board (CARB), which develops model rules for the state's air quality districts to adopt or adapt if needed to help control air pollution.

In October 2007, CARB approved a new and more stringent model rule, but as with all model rules, CARB's new one goes into effect only in California air quality districts that adopt it. CARB has not released the model rule yet, according to CARB, because the Board is making slight revisions to it.

The table below gives a sample of final and model rules for industrial maintenance coatings. In the case of the OTC model rule, OTC member states known to have adopted the rule as of press time are listed below the table in Note 4.

Table 1: Comparison of Current VOC Limits for Select AIM Coatings in U.S.

Coating Type	EPA Rule	OTC Model Rule[4]	CARB Model Rule	SCAQMD Rule
Industrial Maintenance	450	340	250	100
Zinc-Rich IM Primer[1]		—	—	100
Antifouling	450	400	400	—[6]
Anti-Graffiti	600	—	—	—[7]
Concrete Curing and Sealing Compound	700	350[4]	350	100
Concrete Protective Coatings	400	—	—	100[6]
Fire-Retardant				
Clear	850	650	650	—[7]
Opaque	450	350	350	—[7]
Heat-Reactive	420	—	—	—[6]
High-Temperature[3]	650	420	420	420[6]
Impacted Immersion	780	—	—	—[6]
Metallic-Pigmented	500	500	500	500
Nuclear Coatings	450	—[5]	—	—[6]
Thermoplastic Rubber Mastics	550	—[5]	—	—[6]
Traffic Marking	150	150	150	100

Notes:
1. Used only in SCAQMD, as a subcategory of Industrial Maintenance; see metallic pigmented elsewhere for zinc-rich
2. Included in Fire-retardant in the EPA rule
3. In EPA rule only
4. Adopted by CT, DE, DC, ME, MD, NH, NJ, NY, PA, VA; implementation dates vary. Note that Concrete Curing Compounds only are covered in this category.
5. Some of the OTC states retained the EPA standards for Nuclear and Thermoplastic Rubber Mastics.
6. Included under Industrial Maintenance
7. Subsumed under coating category for which they are formulated

Federal Rule on Aerosol Coatings Approved

In November, the EPA announced that it had approved a rule to reduce air pollution related to aerosol paints by setting limits on the reactivity of the solvents in paints rather than by the conventional approach of limiting VOCs by mass (grams of VOC/liter of paint). As of mid-December, the EPA had not published the final rule in the *Federal Register*, but the rule can be downloaded from the Agency's website, given at the end of this article.

Although consumers use 80% of aerosol paints, industrial maintenance painting, automotive body touch-up, and other non-consumer applications account for the other 20% of aerosol paints used, according to the preamble to the new rule. Zinc-rich coatings in aerosol form for field touch-up after shop painting, and temporary traffic and construction

Continued

site marking coatings are examples of aerosols used in industrial maintenance application.

VOCs: What's Reactivity Got To Do with It?

VOCs contribute to smog or low-lying (harmful) ozone when they react with nitrogen oxides in the presence of sunlight. So the premise for regulating VOCs in any fashion is that they are ozone precursors. For one- or multi-component coatings applied to large structures, by brush, roller, or spray gun, most air quality agencies, including EPA (see Table), regulate the level of VOCs, generally hydrocarbon-based solvents in the coatings formulations, to reduce the total emissions that can contribute to ozone.

Aerosol coatings differ from conventional coatings, industrial maintenance or otherwise, in that aerosols have a very high amount of VOCs—perhaps 80% of the can—which is necessary to get the coating out of the can, according to Orville Brown, *JPCL* technical editor and retired R & D director for Diamond Vogel Paints, VP Research and Technology for Courtaulds (Heavy-Duty Group), and Corporate Technical Director for MAB. The VOCs are comprised of solvents required to reduce the viscosity of the paint concentrate and propellants (isobutane and propane) required to expel the paint from the can and atomize the paint for spray application. (That means only 20% of the material in the can is the coating, which is why those cans run out so quickly, notes Brown.) So with 80% or more of the material in an aerosol can being a VOC, aerosol coatings have a significantly higher proportion of solvent compared to conventional coatings.

It is difficult, Brown says, to lower the VOCs of aerosol coatings because solvent is needed for them to work. But all VOCs are not equal, even if their emissions are the same. Some VOCs react more than others with nitrogen oxides; hence, some VOCs contribute more to ozone formation than other VOCs in the same levels.

Regulating reactivity levels will force aerosol coating manufacturers to use less reactive solvents, because substituting water for a propellant won't work.

Some commenters on the EPA rule urged the agency to shift all of its coatings regulations to reactivity-based standards. According to the preamble, EPA sees mass-based limits (g/L) as adequate in some areas of the country but that a recent EPA guidance document on achieving acceptable ozone levels "recognizes that approaches to VOC control that differentiate between VOC based on relative reactivity are likely to be more effective under certain circumstances," such as "areas with persistent ozone nonattainment problems" and "areas that have already implemented VOC reasonably available control measures and need additional VOC

Continued

emission reductions."

EPA allows several methods to calculate reactivity. Limits are given in grams of ozone (O_3)/grams of product.

EPA did not respond to inquiries from *JPCL* by press time.

To read the rule: epa.gov/ttn/oarpg/tlpfpr.html.

OSHA Issues Final Rule on PPE, Proposed Rule for Confined Spaces

The U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) has issued a final rule on personal protective equipment (PPE) as well as a proposed rule on confined spaces.

Under the final rule on employer-paid personal protective equipment (PPE), employers must provide nearly all PPE at no cost to the employee. OSHA anticipates that this rule will have substantial safety benefits that will result in more than 21,000 fewer occupational injuries per year. The rule was published Thursday (Nov. 15, 2007) in the *Federal Register*.

"This final rule will clarify who is responsible for paying for PPE, which OSHA anticipates will lead to greater compliance and potential avoidance of thousands of workplace injuries each year," said Assistant Secretary of Labor for OSHA Edwin G. Foulke Jr.

The final rule contains a few exceptions for ordinary safety-toed footwear, ordinary prescription safety eyewear, logging boots, and ordinary clothing and weather-related gear.

While these clarifications have added several paragraphs to the regulatory text, the final rule provides employees no less protection than they would have received under the 1999 proposed standard.

In other OSHA news, the organization has published in the *Federal Register* a proposed rule to enhance the protection provided to construction employees working in confined spaces. The agency is accepting public comments on the proposed standard until January 28, 2008.

"The existing construction standard for confined spaces would be updated and comprehensively revised to better protect construction employees from atmospheric and physical hazards," said Assistant Secretary of Labor for OSHA Edwin G. Foulke, Jr. "This rule will reduce the number of construction injuries and fatalities and greatly improve safety and health in the workplace."

The proposed rule addresses construction-specific issues and uses a comprehensive, step-by-step approach to confined space safety by setting out how to assess the hazards, classify the space, and implement effective procedures to protect employees. The proposed rule would require controlling contractors to coordinate confined space operations among a site's multiple employers.

Interested parties are invited to submit comments on the proposed rule by January 28, 2008. Comments may be submitted electronically at http://www.regulations.gov, the Federal eRulemaking Portal. See the *Federal Register* notice for more information on submitting comments. For more information, visit www.osha.gov.

Cancer and Painting: Scientists Find More Links

A Working Group of 24 scientists has identified increased risk of bladder and lung cancer in painters and increased risk of leukemia in the children of female painters, said the International Agency for Research on Cancer (IARC), which convened the Group to review and evaluate published scientific findings on cancer risks in a variety of occupations. The Agency reported on the Group's conclusions in December 2007.

Based on earlier research, IARC first declared the occupation of painting carcinogenic in 1989, said the Agency. Recent studies have supported and expanded the initial findings, but more research is needed, IARC said.

"[T]his new evaluation has linked painting to lung and bladder cancer," IARC noted. "The new evaluation also suggests that maternal exposure may be associated with childhood leukemia. It is important that further studies be conducted in this area to confirm whether this risk is real and to identify precautionary measures that are appropriate to consider."

Four of five case-control studies showed significant increases in childhood leukemia when female painters were exposed before or during pregnancy, said IARC.

However, "findings were inconsistent" for leukemia-related cancers in the painters themselves, IARC noted.

The Group found several studies linking painters and heightened levels of genetic damage.

Pinpointing sources of the cancer link is difficult because painters are exposed to a variety of paint ingredients as well as environmental hazards like asbestos, IARC said. "[T]he available information is not specific enough to identify particular agents as the cause of the excess lung or bladder cancers. It also cannot be determined whether cancer risks have increased or decreased with changes in the solvents, pigments, and additives used in paints."

The Work Group also concluded that firefighters' occupational exposure is "possibly carcinogenic" and that women who primarily work night-shifts, such as some nurses and flight attendants, may be at an increased risk for breast cancer.

A summary of the study appears in the December 2007 British medical journal, *The Lancet Oncology*; IARC will publish the complete results in 2008 as volume 98 of the IARC Monographs.

For further information, go to:
www.iarc.fr/ENG/Press_Releases/pr180a.html.

SSPC Announces Updates to PACE Program

SSPC has announced the following updates to the technical program for PACE 2008. The PACE conference will be held January 27–30 in Los Angeles, CA. The complete updated program can be found at www.pace2008.com.

Courtesy of the Los Angeles Convention and Visitors Bureau

Sunday, January 27

Session 1A, Protective Coatings Workshop

• "Protective Coatings: An Overview" will be presented by *Tony Serdenes* only. Kirk Shields will not be a presenter.

Session 3A, Thick Film Coatings

• "Challenges of Field Application of Plural Component, Thick-Film Coatings and Linings; Interior and Geotextile Applications," *Dudley J. Primeaux II, Primeaux Associates LLC, and Lee Bower, PolyVers International.* The presenters will focus on the newest advances in plural-component spray technology for thick-film applications and how they benefit the applicator. (This presentation replaces "Thick-Film Coatings Equipment–State of the Industry Report" by *Murph Mahaffey*.)

Session 3B, Flooring

The session has ben revised to include the following presentations.

• "Creating Value through Water-Based Breathable Flooring Systems," *Thomas Murphy, Sherwin-Williams.* This presentation will provide an overview of water-based flooring technologies and compare the overall value to traditional epoxy flooring.

• "Floor Coating Systems for Moderate and Heavy Duty Service–Selection, Surface Preparation, Application, and Details," *Bruce Mitchell, Carboline Co.* Mr. Mitchell will talk about how to properly select a floor coating system that will meet the performance expectations of the owner.

• "New Coating System–High Performance & High Productivity," *Bharat Naik, Rhino Linings USA.* The author will talk about a new polyurethane-based coating system that offers unique advantages over traditional floor coating systems. (This presentation replaces "Fast Cure Flooring Systems–Minimizing Downtime, Maximizing Productivity," by *Howard Ackerman.*)

Monday, January 28

Session 4B, Performance of Coatings

• "The Newest Technology for Maintenance Coatings: Instant Cure UV Curable Coatings," *Peter Weissman*, will not take place. All remaining presentations for this session will be one-half-hour earlier.

Tuesday, January 29

Session 3B, Bridge: Assuring Performance and Quality Projects

• "Proposed Standard for Levels of Protection," *David M. Hatherill, P.E., Celtic Consulting Services, Inc.* will join *Louis G. Lyras, Corcon Inc., and William LaPage, Celtic Consulting Services, Inc.* in presenting.

More Exhibitors Are on Board

In addition to the 155 companies listed in the December *JPCL* (pp. 131–159), the following companies also are exhibiting at PACE 2008 in Los Angeles, CA. Company offerings and full contact information are given below. For more information, contact SSPC's Lorena Walker—tel: 877-281-7772; ext. 2215; email: walker@sspc.org.

• **Airlessco by Durotech Co.**–is a privately held manufacturer of airless spray equipment designed for daily use by painting professionals. 5397 Commerce Ave., Moorpark, CA 93021; 805-523-0211; fax: 805-523-1063; www.airlessco.com. Booth 836

• ***Business Today***–provides small- and medium-sized business owners and managers with the knowledge and skills to improve business through educational seminars, an informational national magazine, and a research board with cutting edge trends. 1250 Barclay Blvd., Buffalo Grove, IL 60089; 867-910-5189; fax: 847-495-6785; www.businesstodayinc.com. Booth 910

• **The Cardinal Group, Inc./ Environmental Corp.**—offers full-service environmental assessment, hazardous and non-hazardous waste services, consulting, training, and emergency response services. 828 N. Hanover St., Pottstown, PA 19464; 484-945-0575; fax: 484-945-0577; www.cardinalgroupinc.com. Booth 557

• **Dehumidification Technologies, Inc.**—rents or permanently installs desiccant and refrigerant equipment for industrial projects. The company has highly trained and fully qualified technicians. 6609 Avenue U, Houston, TX 77011; 713-939-1166; fax: 713-939-1186; www.rentdh.com. Booth 106

• **Ellis Paint Company**—is a manufacturer of low-voc paints and coatings, including <100 g/l solvent-borne enam-

Continued

el. Ellis also is a specialty waste management company. 3150 E. Pico Blvd., Los Angeles, CA 90023; 323-261-8114; fax: 323-780-9940; www.ellispaint.com. Booth 757

• **Iowa Waste Reduction Center**—(IWRC) is revolutionizing painter training and productivity by introducing products that maximize the effectiveness of the training process. 6112 Chancellor Dr., Cedar Falls, IA 50613. 877-777-0791; fax: 319-268-3733; www.paint.iwrc.org. Booth 136

• **JLS Chemical Inc.**—is a producer and distributor of non-halogenated flame-retardants. Its products are produced in ISO 9001-certified facilities in China. The company also offers custom formulations to meet client's special needs. 1970 W. Holt Ave., Pomona, CA 91768; 909-629-4188; fax: 909-629-4198; www.jlschemicalusa.com. Booth 533

• **Max Access**—rents, sells, and services hoists, modular staging, top rigging, air tuggers, frame scaffolding, and equipment for confined space entry and fall protection. 6829 Long Dr., Houston, TX 77087; 713-640-1005; fax: 713-649-0990; www.max-access.com. Booth 832

• **Microblend Technologies**—has invented, developed, and patented the automated paint machine® (APM®). The system dispenses a full-spectrum of interior and exterior latex paints and primers on demand, at the point of use. 1416 W. San Pedro, Ste. 101; 480-831-0757; fax: 480-892-0385; www.microblendtechnologies.com. Booth 739

• **Noxudol**–makes a line of water borne spray-on coatings manufactured and engineered to provide sound damping and fire-proofing. 12055 Sherman Way, North Hollywood, CA 91605; 818-308-8430; fax: 818-308-8428; www.noxudolusa.com. Booth 1014

• **paintNpause**—makes systems that allow users to conveniently store paint-filled brushes, rollers, and trays in a sealed environment. Users can stop painting and start painting when ready. 1507 Western Ave., #403, Seattle, WA 98101; 206-621-0301; fax: 206-621-0028; www.paintnpause.com. Booth 738

• **Paint Belt Pro, Inc.**—offers the Belt Bucket, a new painting tool that attaches to the user by way of a sturdy belt. It is designed to help make painting faster,

SSPC would like to thank the members of the PACE Education Program Paper Review Committee.

- J. Peter Ault, Elzly Technology Corp.
- Kurt Best, Bayer MaterialScience, LLC
- Earl Bowry, EVB Solutions
- Judy Cheng, Pacific Gas & Electric Co.
- Joe Davis, Tnemec Co., Inc.
- Phil Drooks, Metropolitan Water District
- Dan Heemstra, Carboline Co.
- Harold Hower, *JPCL*/PaintSquare
- Mark A. Hudson, The Sherwin-Williams Co.
- Dale Jones, The Sherwin-Williams Co.
- Eric Kline, KTA-Tator, Inc.
- Robert Kogler, Rampart, LLC
- Kevin Morris, Sherwin-Williams Co.
- Bob Murphy, Sherwin-Williams Co.
- Tom Murphy, Sherwin-Williams Co.
- Bruce Nelson, Maryland State Highway Admin.
- Leo Procopio, Rohm and Haas Co.
- Steve Reinstadtler, Bayer MaterialScience, LLC
- Andy Rogerson, California DOT
- Lloyd Smith, Corrosion Control Consultants & Labs
- John S. Tanner, NLB Corp.
- Joe Walker, Elcometer Instruments Limited
- Joyce Wright, Northrop Grumman
- Charlie Wyatt, Wyatt Development Group

safer, and mess-free. 811 W. Pikes Peak Ave., Colorado Springs, CO 80905; 719-330-1599; fax: 719-532-9268; www.paintbeltpro.com. Booth 810

- **Paint by Terry Potter, Inc.**—offers the Sprayguide attachment designed for an airless spray pole. It is precisely designed to cut crisp, clean edges on both interior and exterior surfaces in a fraction of the time. 1313 Green Forest Ct., Ste. 209, Winter Garden, FL 34787; 407-474-3109; fax: 407-654-6222; www.sprayguidetool.com. Booth 923
- **Petra Industrial Polymers**—is a leading manufacturer of advanced concrete coatings and overlays. The company provides extensive training and tech support and supplies top-quality products at competitive prices. 1940 Petra Lane, Ste. B, Placentia, CA 92870; 888-497-3872; fax: 714-572-6726; www.petraindustrialpolymers.com. Booth 426
- **PDA (Polyurea Development Association)**—promotes market awareness, understanding, and acceptance of polyurea technology through the development of educational programs and product standards; and safety, environmental, and use recommendations. 14 W. Third St., Ste. 200, Kansas City, MO 64105; 816-221-0777; fax: 816-472-7765; www.pda-online.org. Booth 709
- **Pipe Wrap, LLC**—is a manufacturer of composite leak repair, coating, and pipeline reinforcement systems for all types of piping. The company serves the petrochemical, pipeline, marine, mining, agricultural, and retail markets. 1701 Bingle Rd., Ste. 4, Houston, TX 77055; 713-365-0881; fax: 713-463-4459; www.piperepair.net. Booth 950
- **Southern Diversified Products**—manufactures premium performance, non-toxic, solvent-free interior and exterior paints. Its 1,232-color palette contains no VOCs, carcinogens, toxins, or solvents. 2714 Hardy St., Hattiesburg, MS 39401; 781-229-2302; fax: 781-998-0755; www.mythicpaint.com. Booth 910
- **Stand Up Stix**—are reusable, lightweight, interlocking sticks that support doors safely and easily for painting. The system allows users to spend more time painting and less time prepping. 3398 Ridge Rd., Lafayette, LA 94549; 415-290-9295; www.standupstix.com. Booth 111
- **Techno Coatings, Inc.**—is an industrial and commercial coatings contractor that specializes in the application of specialty coatings, abrasive blasting, and lead abatement. The company is SSPC-QP 1, QP 2, and QP 3-certified and offers full-service corrosion surveys and maintenance programs. 1391 Allec St., Anaheim, CA 92805; 714-635-1130; fax: 714-635-6357; www.technocoatings.com. Booth 354
- **Total Safety U.S., Inc.**—provides integrated safety strategies and products. The company's mission is to ensure the safe well-being of its workers worldwide. 11111 Wilcrest Green Dr., Ste. 300, Houston, TX 77042; 281-867-2351; fax: 281-867-2404; www.totalsafety.com. Booth 847

Name Change

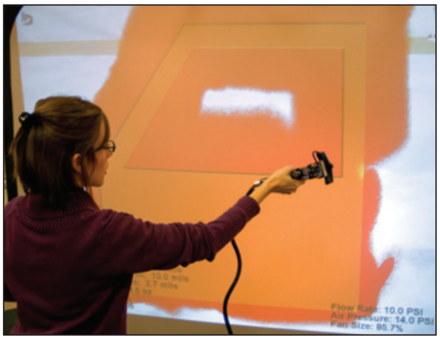
Atrium Environmental Health & Safety Services has changed its name to The Training Network. The company will exhibit in Booth 601.

SSPC Wraps Up Training and Chapter Activities

The following is a brief recap of SSPC training and chapter events for 2007.

The SSPC Three Rivers Chapter held its holiday meeting November 15, 2007, at the Sheraton Four Point Hotel in Mars, PA. Twenty chapter members enjoyed an evening that included a cash bar, Hors d'Oeuvres, a raffle, and a Paint Simulator competition.

Continued



Trying out the Paint Simulator at Three Rivers' holiday meeting.

Lori Smead of Oesterlings Sandblasting & Painting won the raffle, and *JPCL*'s Sharon Steele won the Paint Simulator competition.

In other chapter news, SSPC's Ontario, Canada Chapter hosted a golf tournament on August 23 at Knollwood Golf Club. In addition, the Chapter presented its 2007 GL Stone Memorial Award to Sherwin-Williams' Richard Williams. Past winners of the award include Trevor Neale, Blastech; Jack Mills, Harrison Muir; Stan Walker, Walker and Associates; and Daniel Agnew, Amercoat Canada (all pictured below).

Neale, Mills, Walker, Williams, and Agnew, past and present recipients of the GL Stone Memorial Award.

The award, presented annually, commemorates George Stone, who was the impetus behind the formation of the Ontario Chapter.

SSPC's Concrete Coating Inspector (CCI) course was held November 12–17, 2007, in St. Louis at the Painting and Decorating Council of America (PDCA). There were 14 students in attendance—12 at the certification level and 2 at the technician level. The instructors were Jerry Colahan, Heather Bayne, and Jim Ziegler. This was the last public offering of the CCI course for 2007, bringing the total to six. PDCA's next offering of the CCI course will be January 18–23, 2008, at PDCA's Southern Nevada Chapter in Henderson, NV.

Students in St. Louis take the CCI course test.

Corrpro held the MPCAC course in Norfolk, VA, December 3–4, 2007. Six students in attendance were taught by instructors Terry New and Earl Bowry.

Students are suited up and ready for the MPCAC course in VA.

The CCI course (technician level) also was held October 22–25, 2007, at WGI Heavy Minerals Inc. in Dubai, UAE. Seventeen students were instructed by Jerry Byrd. WGI's Pradeep Radhakrishna was instrumental in helping SSPC set up the class.

CCI training in Dubai, UAE

Dan Zarate teaches the C-1 course in Mexico.

Dan Zarate instructed 30 students who attended C-1, Fundamentals of Protective Coatings, in Mexico at COMEX-KROMA on August 27–30, 2007. COMEX also hosted the Protective Coating Specialist (PCS) course on August 31, with four students participating.

SSPC Individual Member Update

Below is the list of 69 new individual members who joined SSPC in November and December 2007.

If you have questions about joining, contact Sara Petrakovich at 877-281-7772 (U.S. and Canada) or 412-281-2331, ext. 2212.

- Austin Alley, Jefferson City, MO
- Robert Anderson, Sebree, KY
- Leonardo Andrade, Charlotte, NC
- George Assis, West Nyack, NY
- Dale Beard, Chattanooga, TN
- Michael J. Beitzel, Mandeville, LA
- Olivier Bishop, Portsmouth, VA
- Traci Brockway, Mayville, WI
- Sal Bustos, Winchester, CA
- Norma Carper, Winterset, IA
- Eduardo Carrillo, San Diego, CA
- David Claydon, Gateshead, Tyne & Wear, UK
- Robert Clouse Avon IN
- Sunil Kumar, Das Kolkata, West Bengal, India
- Guy Decelles, Louisville, KY
- Chris Defayette, Ottawa, ON, Canada
- Gary Dennis, North Parramatta, NSW, Australia

- William Doran, Pasadena, CA
- Kim Downs, St. Louis, MO
- Peter Duncan, Little Silver, NJ
- Darrin Erickson, Lombard, IL
- Randy Frame, Port Washington, WI
- David Furry, Denver, CO
- Ken Gerdes, Burlington, IA
- Yakov Glozshteyn, Waukegan, IL
- Russell Gray, Watkinsville, GA
- Peter Grimbilas, Wayne, NJ
- Anton Handal, San Diego, CA
- Steve Hechinger, Maryland Heights, MO
- Dave Hill, Crystal Lake, IL
- Ron Holladay, Eureka, MO
- Scott Humphreys, Schaumburg, IL
- Anya Iles, Bremerton, WA
- Ruben Juarez, San Diego, CA
- Kurt Kleinpeter, Harvey, LA
- Kenneth Kroll, Hollywood, FL
- Gordon Kuljian, Murietta, CA
- Brian Lowther, Willmar, MN
- Chris Lucas, Miami, FL
- George Macgregor, Burlington, ON, Canada
- Reginald Mack, Norfolk, VA
- Timothy Majors, Ashland City, TN
- Jean Mayrand, Dorval, QC, Canada
- Thomas Meredith, Monrovia, IN
- Daniel Mijares, Toluca, Mexico
- Osiris Mosley, Brooklyn, NY
- Mark Mosser, Royersford, PA
- Len Nicholls, Lakeview Terrace, CA
- Tim Niedringhaus, O'Fallon, MO
- James Nolan, San Francisco, CA
- Byran Place, Castlegar, BC, Canada
- Paul Purter, Lompoc, CA
- Armando Saenz, Houston, TX
- Dan Sanchez, Riverside, CA
- A. Switzer, Kansas City, MO
- Larry Terrien, Denmark, WI
- James M. Thomas, Chesapeake, VA
- Joseph Thompson, Bremerton, WA
- Larry Thornton, Waco, TX
- Randy Tilley, Castlegar, BC, Canada
- Scott Trammel, Bremerton, WA
- David Tucker, Russellville, AR
- Jeff Vaughn, Henderson, NV
- Chuck Vernon, Newark, DE
- Josh Watters, Maryland Heights, MO
- Michael White, Virginia Beach, VA
- Lucian Williams, Houston, TX
- Matthew Williams, Indianapolis, IN
- Jin Yan, Shanghai, China

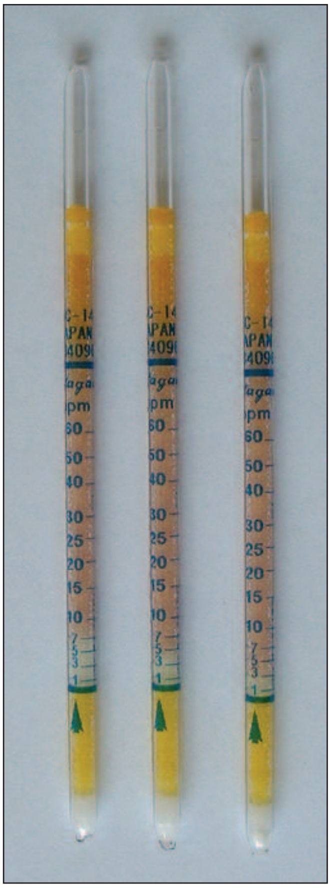
SSPC Board Seeks Nominees

SSPC is now seeking nominations for a seat on its Board of Governors in the category of Facility Owner. The Facility Owner category is defined in the bylaws as "individuals who are employed by public or private sector owners of assets who are responsible for the maintenance of coatings of heavy or light industrial structures and surfaces."

All nominees must be SSPC members. To nominate a candidate, SSPC asks that individuals submit a brief statement detailing the nominee's qualifications by February 15, 2008, to Bill Shoup, SSPC Executive Director, 40 24th Street, 6th Floor, Pittsburgh, PA 15222; phone: 412-281-2331, ext. 2230; fax: 412-281-9992; e-mail: shoup@sspc.org.

On Conductivity and Chloride Concentrations

I want to comment on claims in "Use of Conductivity Measurements to Estimate Chloride Concentrations on Steel or Painted Surfaces," by Chong, Yao, and Lee, that chloride levels cannot be measured directly and that conductivity measurements should be used to estimate chloride concentrations (January 2007 *JPCL*).



First, with regard to measuring chlorides directly, the authors state in the first paragraph that "[t]o determine whether the acceptable level is met for coating maintenance work, it is necessary to *estimate* chloride concentration on substrates...." In the next paragraph they say that chlorides are difficult to measure below 10 micrograms per square centimeter ($\mu g/cm^2$). Two of the authors made a similar comment in an August 2003 article ("Intra Laboratory Assessment of Commercial Test Kits for Quantifying Chloride on Steel Surfaces," *JPCL*, p. 42), stating that the titration tube was hard to read at lower levels. However, as a direct result of the 2003 article, my company changed our titration device to make it more readable at levels well below 10 $\mu g/cm^2$. Above is a photograph of 3 of the modified tubes tested against solutions containing a known 7, 5, and 3 ppm. Unfortunately, the 2007 article is based on the device used in 2003 before modification.

Second, with respect to other substances in the field influencing conductivity, the January 2007 article describes test panels doped with a solution known to contain specific levels of chloride. The authors themselves note the limits of the method, saying "This correlation is valid when sulfate and nitrate ions on steel surfaces are negligible and all the soluble salt ions present are from chloride." But in field samples, conductive substances—such as metals and minerals—not detrimental to steel are picked up along with chlorides. Charts provided through the National Atmospheric Deposition Program, which monitors airborne deposition nationwide of various salts, indicate the widespread deposition of such substances. These minerals and metals do add to conductivity but not to the chloride level, making it impossible to use conductivity to reasonably estimate how much chloride, if any, is present in any solution.

Other soluble salts, such as sulfate or nitrate, are considered less detrimental to steel than chloride; therefore, if the conductivity comes primarily from sulfate, the allowable level of conductivity would be much greater than that for chloride. For example, in the water-jetting standard, SSPC-SP 12/NACE 5, level SC-2 cleaning has an allowable chloride level of 7 $\mu g/cm^2$ and an allowable sulfate level of 17 $\mu g/cm^2$. Moreover, in field samples, sulfate frequently is more prevalent than chloride. One could have no chloride, just sulfate, yet have a high conductivity level when assumed to be due to chloride.

In addition, in my SSPC 1998 paper, "Laboratory Test Parameters for Chloride Testing" (available from me or in the conference proceedings, *Increasing the Value of Coatings*, pp. 48-51), I reported and presented data on panel testing showing that when using time-exposed rusted panels, other factors influence conductivity to the point that no relevant relationship can be made between conductivity and chloride.

Another concern I have with the January 2007 article is that DI water was used to perform extraction, yet in the authors' August 2003 article, they argue that an acidic solution provides more thorough extraction of salts. However, because such acidic solutions are conductive, they probably would not be appropriate for conductivity testing; therefore, conductivity type testing requires the less effective DI water.

The 2007 article also gives chloride recovery rates, or extraction efficiency, obtained with an adhesive cell and DI water, with recovery rates of 80 to 90% predominating. However, when panels are doped, the salt has no time to form an electro-chemical bond to the steel and so lies loosely on the panel. Almost any method of rinsing, with equal agitation, even with tap water, would probably remove an equal amount of chloride.

The research team that generated the information in the article performed good quality work with great accuracy. Unfortunately, since FHWA does not have adequate funding to perform field research, other more affordable methods were employed, such as doped panels. Hopefully someday FHWA will provide adequate funding and perform field research that would result in more realistic information.

Jim Johnson
Chlor*Rid International Inc.

JPCL reserves the right to edit letters for length and style.

Associations

PDA Annual Show Set for Atlanta

The Polyurea Development Association (PDA) will hold its 2008 Annual Conference at the Hyatt Regency Atlanta, in Atlanta, GA on February 12–15, 2008. An exhibition of polyurea products and related services will accompany the conference, whose theme this year is "Polyurea—Where Technology Shapes Solutions." The conference will include many educational opportunities relevant to industrial coatings professionals. Some of these offerings are briefly detailed below.

Educational Sessions

• *Introduction to Polyurea for the Applicator and Contractor*—designed specifically with the applicator and contractor in mind, this session will expand on topics of physical properties of polyurea, testing procedures, surface preparations, application procedures and techniques, and advances in and types of equipment.

• *Surface Preparation Concrete Course*—provides state-of-the-art information and technology on the proper surface preparation of concrete to receive polyurea applications.

• *Chemistry for Contractors 101,* Kelin Bower, Polyvers International LLC—The purpose of this session is to help clear up any confusion on polyurea and its chemistry and to provide tips to take to the job-site. Topics will include Is this Chemistry or Greek?; Reading and Writing in Chemistry; Polyurea Jargon and Terms; What Goes into a polyurea?; Isocyanates–Aromatic and Aliphatic; Amines – Primary,

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Secondary, ECT; and Chain Extenders and Cross Linkers.

General Session Presentations

• *Heated Hose Troubleshooting*, Tom Hults and John Courier, Equipment and Coatings Technologies—heated hose troubleshooting steps that will simplify the analysis as well as save valuable down time will be presented.

• *Polyurea Coatings in Concrete Potable Water Storage Tanks*, Joe Haydu, VersaFlex Incorporated—This presentation describes a polyurea project in the city of Signal Hill, CA, on its 60-year-old below ground concrete tank and sand basin that was leaking.

• *Geotextile Reservoir Lining-Specifying 600,000 Square Feet of Polyurea Success*, Murph Mahaffey, Glascraft, Inc.—This session offers an overview of a 600,000 square foot/55,700 square meter reservoir requiring polyurea over geotextile to create a seamless membrane.

Raw Materials Track

• *Recent Advances in Polyurea Technology*, Kevin Light, Lee Hanson & Ray Scott, The Hanson Group—This session will explore the recent advances in polyurea technology. The market is looking for improvements in the areas of improved stiffness and rigidity, higher heat resistance, improved acid resistance, improved abrasion resistance, and better substrate adhesion.

• *Polyurea Preventing Power Outages Caused by Wildlife*, Tony LaGrange, Quantum Technical Services Ltd.—The use of spray-applied and spray-molded polyurea to prevent power outages caused by birds and other wildlife will be discussed.

For more information on the PDA Annual Conference, contact the PDA, 14 West Third Street, Suite 200, Kansas City, MO 64105—tel: 816-221-0777; fax: 816-472-7765; website: www.pda-online.org.

American Ladder Institute Releases Updated Ladder Safety Standards

The American Ladder Institute (ALI) has released three newly updated standards that outline the rules and minimum requirements for the design, construction, testing, care, and use of wood, portable metal, and portable reinforced plastic ladders. ALI has previously released a series of ladder safety standards, all of which the Institute says are endorsed by the American National Standards Institute (ANSI).

The following three standards were recently updated with important safety requirements.

- A14.1 – 2007 American National Standards for Ladders—Wood Safety Requirements
- A14.2 – 2007 American National Standards for Ladders—Portable Metal Safety Requirements
- A14.5 – 2007 American National Standards for Ladders—Portable Reinforced Plastic Safety Requirements

The 14.2 and 14.5 standards were enhanced after a series of new articulating ladder tests were incorporated, including a series of slip tests that were run on different flooring substrates to make sure there were consistent results. Standard 14.10 was also rolled into 14.2 and 14.5, which included maximum weight ratings for various ladders. ALI says this was a specific request of many telecom and power utility companies that needed ratings for higher duty ladders that can also bear the weight of heavy equipment and tools.

The standards were created by the Accredited Standards Committee on Safety in the Design, Construction, Testing, Care and Use of Ladders -ASC A14 (A14 Committee on Ladder Safety). The scope of the committee is to develop requirements governing the safe design, construction, testing, labeling, selection, care, and use of various common types of ladders, including fixed, job-built, portable, attic stairs, and

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extreme duty rated ladders as well as mobile ladder stands, mobile ladder stand platforms, and ladder accessories.

Don Gibson, vice president of engineering, Louisville Ladder, served as co-chair of the A14 Committee on Ladder Safety and is a member of the ALI Board of Directors. "These new standards bring forth important provisions in ladder safety for manufacturers, industry and the general public to ensure ladder safety is upheld," Gibson said.

The updated standards are available for purchase from ALI at www.americanladderinstitute.org http://www.americanladderinstitute.org/.

Founded in 1947, the American Ladder Institute represents North American ladder manufacturers.

FSCT Announces Board Election Results

The Federation of Societies for Coatings Technology has announced the results of the election of members to its Board of Directors. The following candidates were elected to the three available positions on the Board for three-year terms, with terms of office beginning on January 2, 2008.

- Paul Delmonico, Old Western Paint Co., Inc., Denver, CO
- Chris Harding, Waterlox Coatings, Cleveland, OH
- Robert Henderson, Lonza Inc., Pittsburgh, PA

The above directors will join President Yasmin Sayed-Sweet (Alberdingk Boley), Vice President Joe E. Brown (Cray Valley Ltd.), Secretary-Treasurer Kevin Pelling (L.V. Lomas Limited), and current Directors Mark Algaier (Hillyard Industries, Inc.), John P. Berghuis (Kronos Canada, Inc.), Larry Brandenburger (Valspar Corp.), Natu Patel (Ace Hardware Corp.), Rose Ann Ryntz (IAC Group North America), and James A. Wasik (PPG Industries, Inc.) on the 2008 FSCT Board of Directors.

FSCT provides technical education and professional development for the global coatings industry.

Companies

ISP Names Marketing Director for Performance Chemicals

International Specialty Products Inc. (ISP) has announced the appointment of Scott Edris as Director, Global Marketing—Performance Chemicals. In this capacity, Mr. Ednis is responsible for building strategic marketing plans in the agricultural chemicals and coatings & adhesives markets. He reports directly to Daniel Kaufman, senior director, Global Marketing—Performance Chemicals.

Scott Edris

"Scott comes to ISP well qualified to contribute to the success of our business, with a background that includes over 18 years in Technical Service, Marketing and Product Management," stated Mr. Kaufman.

Before joining ISP, Mr. Edris was segment manager—North American Paints & Coatings Emulsion—with Celanese in Bridgewater, NJ. Before Celanese, he was general manager of an independent marketing firm and divisional marketing manager for the adhesives division of National Starch & Chemical in Bridgewater, N.J.

Mr. Edris earned a BS in chemistry from the University of Delaware.

ISP is a global supplier of specialty chemicals and performance-enhancing products for a wide variety of personal care, pharmaceutical, food, beverage and industrial applications. The company's headquarters is located in Wayne, New Jersey, USA.

Rhino Linings Appoints National Industrial Sales Manager

Rhino Linings USA, Inc.® has named industry veteran Joe Nichy as the com-

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pany's national industrial sales manager, effective immediately. Mr. Nichy brings to Rhino Linings over 20 years of sales management, new business development, and coatings industry experience.

Mr. Nichy was most recently general manager for HSH Aerospace Finishes, an international aerospace coatings manufacturer based in Anaheim, CA, where he had complete executive responsibility for North American Operations. Prior to that, he held senior-level sales and management positions with Sherwin Williams, Flordecor, Ceilcote, and Carboline.

Nichy is a member of SSPC, NACE International, and PCSI (Polymer Coatings & Surfacing Institute.

Joe Nichy

Rhino Linings, headquartered in San Diego, CA, is a global provider of industrial protection linings and coatings and linings for commercial, industrial, military and retail applications.

Products

Gauges Measure Individual Paint Layers

PELT® (Pulse/Echo Layer Thickness) products from JSR Ultrasonics (Pittsford, NY) are microprocessor-based ultrasonic thickness measurement systems for gauging coatings on both non-metallic and metallic substrates. PELT Gauges are non-destructive contact systems that measure single layer coatings as well as multi-layered coatings.

With one measurement, the PELT Gauge can accurately measure the thickness of each individual layer of a coating (up to 5 layers), the company says. This kind of measurement is possible even if the layers were applied "wet on wet," as is the case with many basecoat/clearcoat systems in use today, the company adds.

The gauges are designed for measurements on virtually any type of substrate. According to the company, corrosion inhibitors and pre-treated metallic substrates (i.e., galvanized) pose no problem for the gages—there is no need to subtract the thickness of the inhibitors or treatments from the measurement.

With optional probes, the PELT can be configured to measure many different materials and in some cases, substrate thickness itself can be measured.

For more information, contact JSR Ultrasonics, A Division of Imaginant, 3800 Monroe Avenue, Pittsford, NY 14534—tel: 585 264 0480; email: peltsales@jsrultrasonics.com.

Epoxy Primer for Military, Industrial Coatings Is Greener

Spectrum Coatings Laboratories (Providence, RI), has introduced a "greener" formulation of a high-performance, chemical- and corrosion-resistant epoxy primer for military and industrial applications. According to the company, Spectrum Coatings WE2K-720 provides an environmentally friendly coating solution for use on treated and untreated metal surfaces, such as military vehicles, antennas, and ground support equipment.

The company says the new formulation meets South Coast Air Quality Management District (SCAQMD) regulations and has a lower volatile organic content (VOC) at 1.4 pounds per gallon than is currently required by the military specification Mil-P-53030. Also, the corrosion resistance of the QPL-approved primer is described as comparable to the performance of aircraft primers exceeding the specification requirements of Mil-P-53030A. According to the company, the primer is compatible with most industrial topcoats as well as the following military topcoats: Mil-DTL-64159, Mil-DTL-53039, Mil-PRF-85285, and Mil-PRF-22750.

The new epoxy primer is described as waterborne, non-flammable, and free of lead, chromate, and hazardous air pollutants (HAPS).

For more information on the product, contact Stephanie DeSilva—tel: 401-785-0333; email: sdesilva@vision-strat.com.

CVC Adds New Epoxy Resin for High-Solids

CVC Specialty Chemicals, Inc. has added EPALLOY® 8350X80 to the company's expanding line of high-functionality epoxy phenol novolac resin products. According to CVC, the 80% solids product is suited for use in high-solids coatings formulations to produce high crosslink density as well as good thermal resistance and anti-corrosion properties. It can be used alone or in combination with other Bisphenol A- or novolac resin-based products, the company says.

CVC Specialty Chemicals, Inc., headquartered in Moorestown, NJ, is a producer of specialty epoxy resins, including epoxy phenol novolacs, epoxy monomers, and catalysts for epoxy systems. CVC's products are used in the manufacture of coatings, adhesives, construction products, and other materials.

Binder Meets New U.S. Spec for Highway Paint

Rohm and Haas's Paint and Coatings Materials business (Philadelphia, PA) announced that its new acrylic binder, Fastrack™ HD-21A, meets new Federal Specification TT-P-1952E for waterborne traffic paint with increased durability. With growing emphasis among state DOTs on durability and wet night visibility, the new specification will assist states to achieve their goal of improved high-

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way safety, the company says.

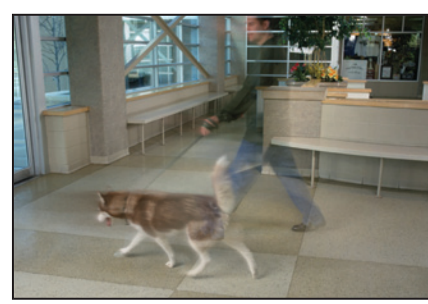
According to the National Highway Traffic Safety Administration (NHTSA), unlighted rural roads are among the most dangerous in the nation. Many years of research have demonstrated that improved and more visible centerlines and edge line markings help reduce accidents and fatalities.

Fastrack HD-21A binder is a 100% crosslinking acrylic that is currently being used by traffic paint manufacturers to produce high-build, durable water-based markings. It has excellent glass bead retention, excellent adhesion to concrete and asphalt highways, and provides exceptional durability, according to the company. Traffic paints based on Fastrack HD-21A binder are currently being used at Cape Canaveral on the landing site for the space shuttle, on high-speed racetracks, on airport runways, on federal and state highways, and on bridges and tunnels, the company says.

For more information about the binder, visit www.FastrackRoadMarkings.com or www.rohmhaas.com.

Decorative Flooring Has Terrazzo Look at Lower Cost

Valspar Flooring, a division of Valspar Corporation (Wheeling, IL), has introduced a terrazzo mosaic flooring alternative that the company says costs less than terrazzo. The Verrazzo decorative flooring system, designed for health care, retail, and commercial environments, merges 100% solids pigmented epoxy, pigment-absorbing background aggregate, and contrasting trowel-grade colored quartz granules that simulate rich mosaic patterns in vibrant color blends. An extensive color palette allows for a range of natural stone textures to complement interiors.



According to Valspar, Verrazzo will withstand long-term exposure to high foot traffic, UV rays, and chemicals, while its specially graded aggregate gives the surface added density for greater compressive strength. Its seamless surface enhances hygienic reliability by eliminating the cracks and crevices where bacteria or mold can dwell, the company adds.

For more information, contact the company—tel: 800-637-7793 x5050; website: www.valsparflooring.com,.email: flooringmarketing@valspar.com.

New Statistical Gloss Meters

Elcometer (Manchester, UK) has announced the launch of its new range of statistical gloss meters. The 406L statistical mini glossmeter and the 407 statistical gloss meter are ideal for measuring the gloss of flat surfaces from matt to mirror finishes, the company says.

The 406L is a small, handheld, user-friendly gauge available as either a single-angle (60-degree) or dual-angle (20-degree/60-degree) version. The 407 is a triple-angle meter, measuring at 20-, 60- and 85-degree angles. According to the manufacturer, both gloss meters offer a "move-and-read" feature for measuring large surfaces quickly and effectively, calibration to any gloss standard, and the ability to store 200 readings that can be downloaded to a PC.

The products also feature statistical analysis of readings as they are taken and menus in six languages. In addition, each instrument is supplied with Novo-Soft TM software for reporting and archiving gloss measurements. For more information: www.elcometer.com.

Book Discusses Blast Cleaning Technology

Blast Cleaning Technology (ISBN: 978-3-540-73644-8), written by Andreas Momber, was published in December 2007 by Springer (Berlin, Germany). The first comprehensive monograph on the subject, the book provides a practical and detailed discussion of the technology and systematically and critically reviews the theory behind the technology, the state of current blast cleaning, surface quality aspects and the effects of blast cleaning on the performance of applied coatings. The 450-page book is written for engineers and consultants in industries involved in surface cleaning and surface preparation. For more information: www.springer.com.

UHP Projects Awarded Deck Resurfacing

By Brian Churray, PaintSquare

Photo courtesy of U.S. Coast Guard Visual Information Server

UHP Projects, Inc. (Newport News, VA) was awarded a contract of $59,819.83 by the United States Coast Guard Maintenance and Logistics Command to perform deck resurfacing work on the *USCGC Dallas*, a 378.25-foot-long high-endurance cutter vessel. The project, which will be performed at the vessel's homeport in North Charleston, SC, involves waterjetting and recoating flight deck surfaces, the helo ops area, and additional deck surfaces. The decks will be refinished with a non-skid epoxy-polyurethane system.

N.G. Painting Wins Tank Rehabilitation Contract

N.G. Painting, Incorporated (Kerrville, TX) was awarded a contract by the BexarMet Water District (San Antonio, TX) to rehabilitate an existing 1.5 MG steel elevated water storage tank. The project includes cleaning and recoating interior surfaces, exterior surfaces, and concrete foundation surfaces, as well as performing various repairs. The exterior surfaces will be abrasive blast cleaned to a Commercial finish (SSPC-SP 6) and coated with an epoxy primer, an epoxy intermediate, and a polyurethane finish; Class 2 containment according to SSPC-Guide 6 is required. The interior wet surfaces will be abrasive blast cleaned to a Near-White finish (SSPC-SP 10) and lined with a 3-coat epoxy system. The interior dry surfaces will be spot power tool cleaned (SSPC-SP 3) and coated with a 2-coat epoxy system. The concrete foundation will also be coated with a 2-coat epoxy system. The contract, which requires the use of dehumidification equipment, is valued at $1,128,000.

Illinois DOT Lets Bridge Painting Work

The Illinois Department of Transportation awarded a contract of $321,000 to All States Painting, Inc. (Alexander, IL) to recoat a portion of the existing structural steel surfaces on six bridges in Johnson and Williamson counties. The contract, which required SSPC-QP 1 and QP 2 certification, includes containment of lead-based paint. The steel will be abrasive blast cleaned to a Near-White finish (SSPC-SP 10) and recoated with an organic zinc-rich primer, an epoxy intermediate, and a urethane finish. The contract also includes applying a boiled linseed oil protective coating to 1,152 square yards of concrete surfaces.

Blastco Awarded Tank Painting Project

Photo courtesy of the City of San Marcos

Blastco, Inc. (Houston, TX) was awarded a contract of $94,500 by the City of San Marcos, TX, to perform coatings application and minor repair work on an existing 270,000-gallon standpipe water storage tank. The contract, which required SSPC-QP 1 certification, includes cleaning and recoating the interior and exterior surfaces of the 26-foot-diameter by 68-foot-high steel tank. The exterior surfaces will be pressure washed at 3,000 psi, spot hand tool and power tool cleaned (SSPC-SP 2 and SP 3), and overcoated with a spot primer of a 100%-solids epoxy penetrating sealer and two full finish coats of polysiloxane. The interior surfaces will be abrasive blast cleaned to a Near-White finish (SSPC-SP 10) and lined with a 100%-solids elastomeric polyurethane system. The lining procedure requires the use of forced air ventilation or dehumidification equipment.

R&M Sandblasting & Painting To Perform Tank Coating

R&M Sandblasting & Painting (Gibsonia, PA) was awarded a contract of $1,131,963 by the Monroeville Municipal Authority (Monroeville, PA) to abrasive blast clean and recoat the interior and exterior surfaces of an existing 10 MG water storage reservoir. The contract includes containment of the existing lead-bearing coatings.

RPI Coating Secures Reservoir Rehabilitation

RPI Coating, Inc. (Santa Fe Springs, CA) was awarded a contract of $3,955,182 by the City of Henderson, NV, to perform various improvements on four existing potable water storage tanks and one existing reuse water storage tank. The project includes cleaning and recoating the interior and exterior surfaces of all five tanks. The existing coatings contain lead, necessitating containment. The interior surfaces will be abrasive blast cleaned to a White Metal finish (SSPC-SP 5) and lined with a three-coat epoxy system. The exterior surfaces will be abrasive blast cleaned to a Near-White finish (SSPC-SP 10) and coated with an epoxy primer and an aliphatic polyurethane finish. The project also includes blast cleaning and sealing concrete foundation surfaces with a cementitious waterproofing slurry.