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SSPC The Society For Protective Coatings
The Voice of SSPC: The Society for Protective Coatings

Features

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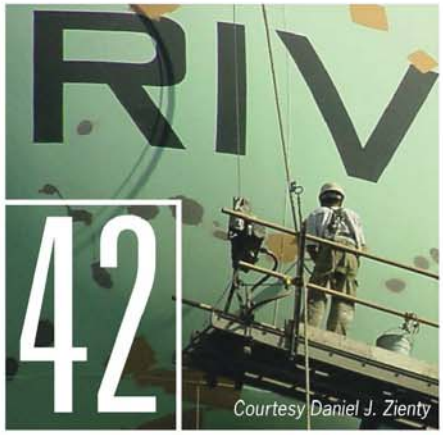

Departments

Also This Month

From the Offices of SSPC

The Society For Protective Coatings

Staff

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What's The Plan, Stan?

Whether you call it a strategy, a plan, an approach, or a method, you're unlikely to achieve the results you're looking for without one. Like a good roadmap, a good plan will reveal how to get to your destination, avoid wrong turns, and show you another route when roadblocks do occur.

That's especially true when it comes to maintenance of protective coatings on industrial structures. With an efficient inspection plan in place, smaller issues can be addressed before they become full-blown corrosion catastrophes. Being proactive might involve an initial investment, but it can generate overall cost savings over time.

Issues of aging infrastructure, budgetary limitations, and low tolerance for downtime that stops the flow of water or traffic are a constant in our industry. Factor in conditions such as the presence of hazardous materials, access difficulties, and environmental and workplace regulations, and a good maintenance plan becomes critical.

The features in this issue discuss the impact of plans and planning. We look at projects aimed at extending service life and saving time and money. Whether your work involves

recoating a bridge 500 feet in the air or rehabbing underground storage tanks, achieving the goal always depends on a good plan.

Abraham Lincoln once said, "Give me six hours to chop down a tree and I will spend the first four sharpening the axe." Honestly.

Pamela Simmons
Editorial Director

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Webinar Education Series

Free Webinar on Epoxy and Vinyl Ester Tank Linings Offered

The 2014 SSPC/*JPCL* Webinar Education Series continues in June with another new, free webinar.

"Epoxy & Vinyl Ester Tank Linings," will be presented on Wednesday, June 4, from 11:00 a.m. to 12:00 noon, EST.

Similar to all downstream oil and gas plants, chemical/petrochemical plants, and production plants, power generating facilities need storage and process tanks whose internals require linings to protect against contamination of the cargoes and corrosion of the structure. The challenge for utility owners or their engineers is to assess the multitude of options available to them in order to maximize their resources. This webinar gives an overview of some of the key performance features and business considerations that should be evaluated when considering the use of vinyl ester and epoxy tank linings, particularly at elevated temperatures. This webinar is not intended to be a comprehensive guide to these two types of linings, nor is it intended to address other generic types of tank linings.

ACA Appoints First Female Leader

The American Coatings Association (ACA) has announced the election of Sandra Berg, president and CEO of Ellis Paint Company, as the new chairman of ACA's Board of Directors, making Berg the first woman to hold this position in the organization's 126-year history.

In addition, Valspar chairman and CEO Gary E. Hendrickson was elected ACA's vice chairman and treasurer.

Berg was elected ACA's vice chairman and treasurer in 2012. She became president of Ellis Paint and its spin-off company, Pacific Resources Recovery Services, in 1992. She was also appointed to the California Air Resources Board (CARB) in 2004 by then-Governor Arnold Schwarzenegger. CARB is the leading policy agency responsible for the air quality in the state.

Sandra Berg

Gary E. Hendrickson

Hendrickson became CEO of Valspar in 2011 and previously served the company as president and COO. He joined the company in 1994, starting in its packaging business.

Both Berg and Hendrickson will serve two-year terms that will end in April 2016. The ACA's 43-member board includes representatives from major coatings and raw materials manufacturers.

The webinar will be presented by Jeff Stewart, sales engineer for Blome International, a division of Hempel which specializes in industrial coatings and linings. He graduated from the University of Pittsburgh with a B.S. in chemical engineering and received a Professional Engineering License from the state of Ohio. He obtained NACE Level I and II CIP certifications, worked for more than 14 years as an engineer in coal-fired generating plants, and has more than 18 years of experience in technical sales for lining manufacturers. He has previously had articles published covering the issues of specification writing, tank lining selection, and project cost analysis.

This webinar is sponsored by Blome International and Binks DeVilbiss.

Registration, CEU Credits

This program is part of the SSPC/*JPCL* Webinar Education Series, which provides continuing education for SSPC re-certifications and technology updates on important topics.

SSPC is an accredited training provider for the Florida Board of Professional Engineers (FBPE), and Professional Engineers in Florida may submit SSPC Webinar Continuing Education Units to the Board. To do so, applicants must download the FBPE CEU form and pass the webinar exam, which costs $25.

Register for this online presentation at www.paintsquare.com/webinars.

Correction

On p. 58 in the April *JPCL* Annual Industrial Painting Contractor Directory, the company Carnefco Curaçao should have been listed under NETHERLANDS ANTILLES. *JPCL* regrets this error. It has been corrected in the online version on paintsquare.com.

Paint BidTracker Launches Long-Term Leads Service

Paint BidTracker, Technology Publishing Company's online construction lead reporting service, has added Agency Spending Reports to its list of product offerings. The reports will detail long-term, pending construction leads that are based on capital spending reports from public agencies.

With expected bid dates that are generally two or more years into the future, the reports can provide contractors and suppliers with additional time to prepare for the bid stage ahead of competitors, assure that their products are included in the specification process, and predict future industry spending. Users will access the long-term leads through an online searchable database, similar to the standard Paint BidTracker service.

Other details to be included in Agency Spending Reports are:

- the estimated year the project will bid and the contract length;
- the total projected budget for the project;
- the projected budget per contract year;
- the bidding agency and location;
- the level of government responsible for the project;
- a statement explaining why the work is expected to be necessary;
- a description giving an overview of the work anticipated;
- the level of priority that has been assigned to the project by the owner;
- links to the original Capital Improvement Plan documents; and
- the agency contact information.

The Agency Spending Report feature is an upgrade option not included with the basic subscription. It is the first feature to be released in a series of Paint BidTracker enhancements. The coatings-focused market data service ConTrak is expected to launch in the beta phase this June.

Contact Howard Booker at 800-837-8303, ext. 157, or hbooker@paintbidtracker.com for annual pricing and detailed information. Visit www.paintbidtracker.com/contrak_learn for details about the upcoming ConTrak product.

The BUZZ on PaintSquare.com

HOT! This Month

Coating Inspectors: Are We Necessary?

Warren Brand's recent blog debating the role of the coating inspector sparked interesting comments from our readers.

Mark Puckett: *"Inspectors are QA, not QC. They can only enforce specifications as written, but communication is essential. Boilerplate specs are the bane of the industry, and site-specific specifications really are essential for all bidding parties to know what is to be expected. Too many owners don't understand the importance of proper qualified inspection and actual, useful QC programs by contractors."*

Kevin Hahn-Keith: *"I agree that quality control is not the inspector's job to perform for the contractor, but in my experience, inspectors are necessary for quality assurance. It is the exceptional, uncommon case where the low bidding firm is going to be conscientious about following the specifications. Documentation is also a key part of the inspector's job, and in my opinion, contractors are not very good at providing documentation of their projects."*

Ryan Smith: *"Perhaps the real problem here is 'who' is hiring the inspectors. If contracts were rewritten and contractors were allocated money to hire their own third party inspector, or train someone to fill that role in their organization, would that change things? An unqualified person doing an inspection seems dangerous, so it seems to me the need for qualified inspectors will always remain. Maybe we simply need to rethink the way we utilize their expertise."*

Popular Poll

(Among Poll questions from Apr. 7 to May 2)

How should industry employers treat marijuana in states where it is now legal?

50%	Pot should be treated like tobacco in the workplace.
39%	Pot should be treated like alcohol or drugs in the workplace.
9%	Pot use compromises safety; companies shouldn't hire pot smokers.
2%	If it's OK with the company, it's OK with me.

PSN TOP 10

(as of May 2)

1. Corrosion Reported on New Bay Bridge
2. Tower Painter Falls to Death
3. Coating Inspectors: Are We Necessary?
4. 'Major' Changes Loom for Coating Makers
5. $500K Paid for Unwanted Bridge Designs
6. Applying Coatings Outside of the Recommended Thickness Range
7. Officials Cry Fowl on Painting Holdup
8. Sherwin-Williams Drops Comex Quest
9. PA Orders Vast Impoundment Closed
10. OH River Bridge Slides Into History

MOST POPULAR QUIZ

(From Apr. 7 to May 2)

True or false: Titanium dioxide is a highly opaque pigment.
(Answer at bottom of page)

Quiz Leaderboard (As of May 6)

Robert Cloutier 22/23
Robin Hasah 22/23
Parvez Shaikh 22/23
Ronald Beebe 22/23
Doug Driscoll, Sr. 22/23

→ Results

Answer: True. This inorganic mineral imparts hiding to a coating.

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On Coating a Steel Roof Exposed to Harsh Conditions

What type of coating system (and surface prep) should be used to protect a steel factory roof that is subject to hydrochloric acid vapors and other industrial pollutants and particulates in a hot, humid environment?

Nathan Spencer
Alliance Power and Data

I would be looking at high-build, highly chemical-resistant polyureas. They have extremely good vapor transmission figures and chemical resistance. Good cleaning and priming is imperative, as stainless steel can be a difficult substrate at the best of times.

Pieter van Riet
Corrocoat SA

The inside of galvanizing and zinc processing plants can be highly corrosive due to acid fumes. Hydrochloric acid (HCl) is a volatile acid and will evaporate from open tanks and condense in roof spaces, depending on ambient conditions. The corrosion of steel due to HCl will form soluble metallic salts such as ferric chlorides, which are electrochemically bonded to the steel, and which are not removed during normal surface preparation activities unless specifically addressed. The less effective your efforts to remove these soluble metallic salts to low levels are, the greater the need to select a coating with above normal diffusion resistance to limit and retard diffusion of water molecules down to the substrate, where it can dissolve these soluble metallic salts to form an effective electrolyte under the coating.

When using epoxy-based materials, it is imperative that acid on the surface is decontaminated thoroughly, as residual acid can affect the polymerization of the coating material. This same reason can make a typical multi-coat system problematic if it needs to be applied during plant operation, as fumes settling on the coated surface during application can cause coating failure down the line. Ideally, you need a single-coat system or a system that can be applied wet-on-wet. A quick-drying and -curing system reduces the time it is at risk. The coating should have very good diffusion resistance (low vapor transmission rate) to reduce the number of water molecules that reach the substrate. The coating should be a high-build material that can create a thick film (long diffusion path length) quickly. The material should dry to produce a coating film that will not be chemically attacked by the acid fumes condensing or settling on the painted structure. We have had great success using a glass-flake polyester metacrylic coating, applied as a single-coat system.

Bill Slama
Ceilcote Products

Pieter van Riet stresses a very important factor that is most important to any protective coating application: to take steps to "clean" the surface prior to coating and to assure that the surface is not contaminated with soluble salts—especially chlorides. This is even more important for elevated temperature immersion service.

Regarding the best coating selection, and in accordance with Pieter's selection criteria, we have found that flake-filled vinyl ester coatings applied in two coats at about 0.5 mm per coat, have been very effective in solving this type of corrosion problem.

Warren Brand
Chicago Coatings Group

Wow. This is a tough one. I've worked on a problem exactly like this over a pickling line at a steel mill. It wasn't the roof, but the stainless steel duct that was failing. In that case, we specified power washing and hand tool cleaning the duct and applying a unique UV-cure vinyl ester with pre-impregnated FRP. This system worked very well because it was applied in sheets (like wallpaper), and it adhered to itself. We would not have used this for a roof. For what is described here, first, one would have to determine if the roof has movement, then identify an optimal coating solution that fits the logistics and access. The surface prep would then be dictated by the optimal coating identification requirements.

JPCL

Problem Solving Forum questions and answers are published in *JPCL* and *JPCL*'s sister publication, *PaintSquare News*, a daily electronic newsletter. To subscribe, go to paintsquare.com/subscribe. Occasionally, PSF questions and answers are republished. Participants' company affiliations are listed as they were when the answers were originally submitted.

SSPC PROTECTIVE COATINGS SPECIALIST

Q&A with ANDY ODORZYNSKI

by Charles Lange, *JPCL*

Andy Odorzynski is the Director of Tank Coating Operations for Caldwell Tanks, Inc., a storage tank and civil construction contracting company based in Louisville, Ky. Before holding his current position with Caldwell, he served as a sales manager and a quality control inspector with the company. In addition to his SSPC PCS certification, he is a NACE Level 3-certified Coatings Inspector. He holds a B.S. in finance and is currently completing studies to earn his MBA from the University of Louisville.

JPCL: How did you get your start in the protective coatings industry?

AO: I grew up in a family of tradesmen. After high school I joined the Painter's Union and began my apprenticeship. I noticed that nearly all the other apprentices were focusing on residential and commercial painting. It struck me as an opportunity when I looked at all of the structures around me in need of more complex industrial protective coatings, and realized that none of my younger counterparts were learning to take on that type of work.

I decided that if I was going to go into industrial protective coatings, I wanted to be good at it. I pursued every avenue to learn and advance. Fortunately for me, I was surrounded by people who were willing to teach me, offer me opportunities, and act as mentors.

JPCL: At 31 years old, compared to some 30- and 40-year coatings veterans, you're relatively young for this industry. How can your age and level of experience be a positive for you in your line of work? Does it ever work against you in other situations?

AO: I feel lucky to have been the "young guy" during the information age. Millennials in today's workplace can often provide the technological savvy our more experienced counterparts may lack. I have always been a technophile. It has served me well to be able to lead the charge as information technology reshapes our lives and businesses.

It can be cumbersome to have to convince someone of your value just because of your age. When you are younger, you have an obligation to prove your worth; you haven't earned the benefit of the doubt. I don't think that is a bad thing. I am not afraid to prove I can pull my weight, and I respect people who have a "show me" attitude. I have that attitude with everyone around me, regardless of his or her age.

JPCL: Your educational background is in finance, but you also have experience painting out in the field. Which do you prefer more: crunching numbers in the office, or spending a day out in the field or at a job site?

AO: I started going to night school at 25 because I wanted to increase my contribution. I have stayed with the protective coatings industry because I enjoy it. It is a massive part of my personal identity. However, I knew I was capable of offering more to society than my labor in the field.

I strongly believe in the dignity of all work. When I look at the changes occurring in our country as we navigate the transition from a manufacturing economy to a service economy, I see a fatal flaw. We are undervaluing (which leads to underinvesting in) the trade work that supports our nation's infrastructure.

JPCL: What has been your best resource for expanding your knowledge of the industry?

AO: Training, classes, and conferences are the primer for actual productivity. They are vital to being able to understand and react to the challenges we face in actual day-to-day operations. However, it is in the actual application that real learning happens. The complexity of our industry is growing at an exponential rate. It takes a lot of dedication to find success. The network of industry experts who have taken me under their wing has been the most valuable asset I have when it comes to learning the hard lessons. I would never have survived my first week on the end of a blast hose if not for the tutelage of those around me. The same is true today. I rely on the

expertise of the engineering community, product representatives, consultants, and my own coworkers to create success. I encourage anyone entering this industry to realize that we are a relatively small community and build their network aggressively. You won't last if you don't have experienced people to call when you need advice.

JPCL: Let's say one of your peers is looking to start a career and expresses interest in the coatings industry. What advice would you have for this person? Do you think the coatings industry is a good industry to start a career in today, and why?
AO: I would encourage this person to get out into the field, get your hands on the tools, and understand how you really make money. It's a wonderful thing when a person finds a career path that is aligned with his or her passion. For the right person, I believe the coatings industry provides an amazing opportunity. Coatings is a career path for those who are ready to work hard. If you are one of them, it offers the opportunity to differentiate yourself and become extremely valuable to the company you work for and society as whole.

JPCL: You're finishing up your studies to earn your MBA. Has it been challenging juggling your studies with your everyday work? If so, how have you dealt with these challenges?
AO: Long hours, aggressive travel schedules, and a never-silent iPhone are a given—and that's before I even think about school. In the end, it's all about perspective. I ask the tradespeople who work at Caldwell to stay away from home for weeks (sometimes months) at a time, put in long hours, and work very hard. If that's what it takes for our company to succeed, why shouldn't I deliver in kind? I find myself a 31-year-old man being given the opportunity to pursue a life-changing education at a world-class university. It may be a challenge, but it's one I undertake with a grateful heart and a sense of duty to those I seek to lead.

JPCL: What is your favorite thing about the work you do?
AO: My father is a carpenter. To this day I take an enormous amount of pride driving around Toledo, Ohio, whenever I return home and thinking, "My dad built that." I was led into the trades because I experience the same pride in a job well done. There is something about seeing the transformation from nothing to something, or rusted to shiny, that is intrinsically rewarding for me. The work we do allows me to travel all over the country and experience the same pride when I think, "We did that."

JPCL: What has been the highlight or proudest moment of your career so far?
AO: Being asked to lead the operations team at Caldwell was a major milestone for me. This position requires an understanding of the job site and the business. I have spent the 13 years of my life since high school aggressively working to gain a command of both. It's a humbling challenge to be put at the helm of such a complex operation.

Odorzynski stops for a photo while hiking along the Appalachian Trail in Shenandoah National Park in Virginia.

JPCL: What are some of your hobbies outside of work? How do you like to spend your free time?
AO: I am careful to make time to take in University of Louisville athletic events as a spectator. Beyond that, I do a lot of hiking and backpacking, enjoy cycling as exercise, and try to read recreationally as much as my schedule will allow.

Saponification: From Paint to the Grave

By E. Bud Senkowski, P.E., PCS, KTA-Tator, Inc.
Richard A. Burgess, PCS, KTA-Tator, Inc., Series Editor

At its very basic level, saponification is the term given to the process in which vegetable oils and animal fats are converted into soap. We recognize soaps as wax-like products, modified through the addition of fragrances and skin-care additives (emollients) to become consumer cleaning and bathing products. The essential step in the soap-making process is the incorporation of an alkaline substance, like lye (sodium hydroxide, NaOH). The lye provides a source of hydroxyl ions (OH-) that digest and break down the structure of the oil or fat and produce various triglycerides. An example is shown in Figure 1.

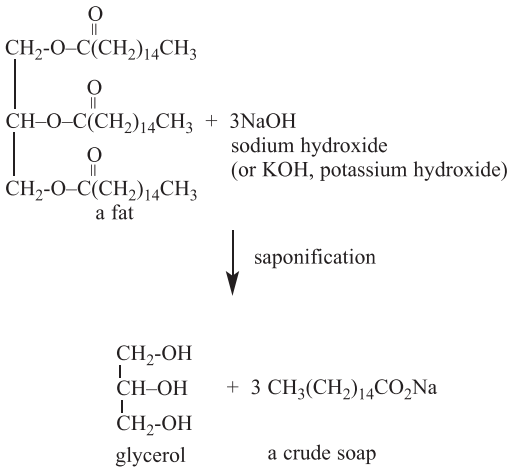

Fig. 1: The saponification process. All figures courtesy of the author.

This article explores the many facets of saponification, including the chemical and environmental conditions that must be present for saponification to occur, and how it contributes to paint adhesion failures. A real life example of a saponification failure is discussed in-depth to aid in understanding the process.

From Paint: The Destructive Nature of Saponification

Saponification can be destructive to paint films. Oil-based paints that utilize alkyd esters, epoxy esters, or linseed oil derivatives in their composition can saponify when exposed to an alkaline environment and moisture. Some polyvinyl acetate (PVA) water-borne latexes can also be broken down by saponification. The saponification reaction forms water-soluble soaps at the interface between the coating and metallic or masonry substrate. These soaps become soft, sticky, and dissolve when exposed to moisture. The moisture can be present in the original wet coating; as atmospheric humidity that passes through the cured coating film and reaches the alkaline substrate; or, in the case of cementitious materials, as free moisture from the mix, ground water, or leaks (water intrusion).

Some alkyd formulations will not undergo saponification. These formulations incorporate a modified alkyd. For example, modifications that employ diisocyanate as a substitute for dibasic acids result in products commonly referred to as uralkyds. Ester groups are replaced with a urethane linkage and superior alkali resistance compared to conventional alkyds. Modified alkyds can even be blended with Portland cement or zinc/zinc pigments. Other coating binders that resist saponification include acrylic and solvent-borne epoxy formulations.

Saponification of Painted Masonry Surfaces

Masonry surfaces with an alkaline condition include new concrete, tilt-up slabs, stucco, plaster, and mortar. These masonry surfaces are characteristically alkaline, with a pH range of 8 to 14. For example, freshly poured concrete and plastered surfaces initially have a very high pH that can range

from 12 to 14. These surfaces are sometime referred to as "hot" by coating applicators. As the masonry surfaces cure, the pH range will drop to a range of 10 to 12. However, the surfaces will still be prone to saponification if oil-based or conventional alkyd coatings are used.

Saponification of Painted Metallic Surfaces

Metals that have an alkaline surface condition include zinc (galvanizing), copper, magnesium, tin, and lead. Painting over ferrous metals such as mild, carbon, and stainless steels or iron will not cause saponification. Iron in solution does not produce an alkaline environment. A Pourbaix diagram is used to predict the tendency of a metal surface to develop alkaline condition in an aqueous environment. Figure 2 is a Pourbaix diagram that shows the zinc species (compounds) that will be present in the solution. Zinc, being amphoteric, is soluble in acid and base (alkaline) solutions, but the species present will be a function of equilibrium between the zinc species. The passive zone (pH 8.5–10.5) is where a surface layer of zinc hydroxide ($ZnOH_2$) forms and zinc metal corrosion does not occur. It is important to note that this exists within the stable range for water (the area within the dotted lines) while exhibiting a pH level of 8.5 to 10.5. Beyond this region, corrosion occurs at higher pH values and will produce saponification. Recall from Figure 1 that it is the hydroxide ions (OH-) that react with the oil, alkyd, or fat to form glycerides and soaps. Excess OH- ions are what makes an aqueous solution basic just as excess H+ ions make a solution acidic. A similar Pourbaix diagram can be drawn for copper, lead, magnesium, and tin metal surfaces in an aqueous (water) environment.

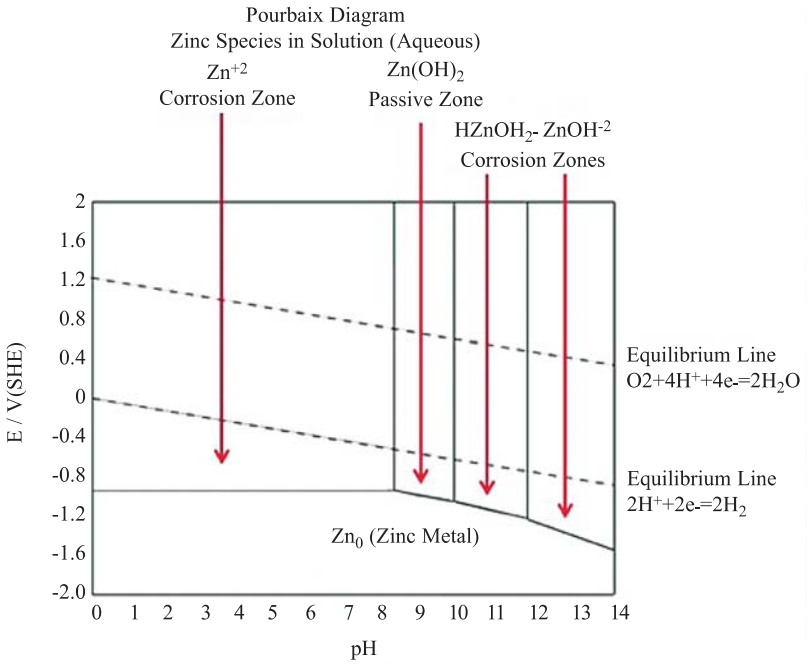

Fig. 2: Pourbaix diagram of zinc in an acqueous environment

A Real World Example of Saponification

The interior surfaces of galvanized steel roof decking applied in a large warehouse were painted by the direct application of two

Fig. 3: Areas of coating delamination where Coating B was applied

different dry fall alkyd coating systems. Coating A was an alkyd coating modified with approximately 15% Portland cement. Coating B was an epoxy ester (modified alkyd) dry fall coating. Both coating systems were essentially 50% solid, single-component formulations with a solvent blend of hydrocarbons. The solvent phase was designed to evaporate so rapidly that any overspray would become a dry powder as it fell through a vertical distance of eight feet. Both Coatings A and B were recommended by the coating manufacturer as suitable for application to galvanized metal substrates. The work location was in Fort Walton Beach, FL.

The dry fall coatings were spray applied at a DFT range of 3–8 mils and reached a full cure in seven days at 77 F. Following the spray application, there were no apparent problems. However, within several months of application, delamination was observed on the interior galvanized deck ceilings that were coated with the epoxy ester dry fall coating (Coating B) and within the immediate vicinity of a series of roll-up doors (Fig. 3). The surfaces painted with Coating A showed no signs of distress.

Investigating the Failure

The field investigation consisted of visual observations, dry film thickness measurements, and adhesion tests. Samples of the coating also were collected for laboratory analysis.

Fig. 4: Photo at left depicts adhesion test result on surface with Coating B. Photo at right depicts test result of surface with Coating A.

Dry film thickness measurements were obtained in general accordance with ASTM D7091, Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals. Dry film thickness measurements of the exposed galvanized steel were taken and then deducted from the total system thickness that was measured.

Adhesion tests were conducted in accordance with ASTM D3359, Standard Test Methods for Measuring Adhesion by Tape Test. The test involved making an X-scribe in the paint film. An adhesive tape was applied to the scribe and then lifted off of the surface. Adhesion was rated on a scale of 0A to 5A according to the amount of coating removed by the tape, with 5A being best (no coating removed).

Field Investigation Results

Essentially, the field investigation revealed the following.

- There were significant areas of coating delamination found on the interior galvanized steel decking that had been coated with the epoxy ester dry fall coating (Coating B) and were in the immediate vicinity of roll-up doors (Fig. 3, p. 17). There were no areas of coating delamination on surfaces that carried Coating A, regardless of their location within the building.
- When the areas of delaminated coating were tested for adhesion properties, the results indicated generally poor coating adhesion with ratings in the range of 2A to 3A. Separation occurred between the coat-

ing system and the substrate. Both the back of the delaminated epoxy ester coating and the underlying substrate felt waxy. No coating delamination was observed on surfaces that were painted with Coating A.

- Adhesion tests conducted on galvanized deck surfaces that were painted with Coating A revealed excellent coating adhesion, with an ASTM D3359 rating of 5A. At these locations, the coating had to be scraped off with a sharp wood chisel. The underlying substrate in these areas was shiny. There was no evidence of the waxy film that was found underneath Coating B (Fig. 4).

Laboratory Investigation Results

Infrared (IR) spectroscopy was used to analyze the failed coating and the waxy substance found on the back of the failed Coating B removed from the galvanized surfaces on the interior decking (Fig. 5). A control sample supplied by the coating manufacturer was also examined by IR spectroscopy. The analyses determined that the failed coating and control sample of the coating were consistent in formulation with a calcium carbonate-filled epoxy ester coating. Analysis of the waxy material at the interface of the delaminated coating was found to be consistent with the carboxylic acid salts produced by alkaline hydrolysis of an ester.

Fig. 5: The galvanized metal substrate is visible after the loosened Coating B was removed. Apart from a slight waxy feel, the saponified layer is transparent and must be confirmed by analytical testing using IR analysis.

Recommendations

Surfaces containing the failed epoxy ester coating were to be washed with pressurized water with enough pressure (5,000–10,000 psi) to remove all of the deteriorated coatings. It was anticipated that this process would remove all of the saponification products. The pressurized water washing was to be supplemented by brushing and scrubbing incorporated with an aqueous cleaning agent. Following cleaning, the surfaces were to be inspected to verify that no artifacts of saponification remained.

Once the surfaces were prepared, a primer specific for galvanizing

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Fig. 5: The galvanized metal substrate is visible after the loosened Coating B was removed. Apart from a slight waxy feel, the saponified layer is transparent and must be confirmed by analytical testing using IR analysis.

Recommendations

Surfaces containing the failed epoxy ester coating were to be washed with pressurized water with enough pressure (5,000–10,000 psi) to remove all of the deteriorated coatings. It was anticipated that this process would remove all of the saponification products. The pressurized water washing was to be supplemented by brushing and scrubbing incorporated with an aqueous cleaning agent. Following cleaning, the surfaces were to be inspected to verify that no artifacts of saponification remained.

Once the surfaces were prepared, a primer specific for galvanizing

was to be applied and then overcoated with one or two coats of a 100% acrylic dry fall coating.

Conclusions

A unique characteristic of the failed coating areas, and the actual cause of the coating failure, was the presence of a deposit on the epoxy ester coating in the failed areas. Infrared spectroscopy revealed that the deposit was consistent with carboxylic acid salts—a reaction product from the alkaline hydrolysis of epoxy esters (saponification). Epoxy esters, oil and alkyd resins can saponify when applied to galvanized surfaces that experience humid conditions.

The source of the alkaline surface is the galvanizing itself. The alkaline nature of the zinc surface can be predicted by the Pourbaix diagram for zinc metal in an aqueous environment (Fig. 2). This reaction forms a soap-like material at the coating/substrate interface and eventually causes the coating to delaminate from the substrate. Epoxy esters are oil-based coatings with epoxy resins.

Since humidity is essential for the saponification reaction to occur, it is not unexpected that the most prevalent failures were in areas adjacent to the roll-up doors. Further inside the buildings, where HVAC limited humidity, it was demonstrated that the epoxy ester coating could be used successfully over the galvanized surfaces.

To Grave—A Bizarre Example of Saponification

Oddly, the same process of converting animal fat to soap has also been documented with human corpses. The Mütter Museum in Philadelphia, PA, has on display an exhumed human corpse, originally buried in 1792, that was converted to adipocere. Adipocere, also known as corpse wax or the fat of graveyards, is a product of decomposition that turns body fat into a soap-like substance. Corpse wax is the result of saponification when body fat is exposed to anaerobic bacteria in a warm, damp, alkaline environment. Saponification will stop the decay process in its tracks by encasing the body in this waxy material, turning it into a "soap mummy." The wax is ester of alcohol and fatty acids. They differ from fats since they don't have triglyceride ester of three fatty acids which can be attributed to the anaerobic bacteria. While somewhat bizarre, the event again demonstrates how saponification will convert any oil or fat into soap.

JPCL

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Applicator Training Bulletin

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Safety Considerations for Abrasive Blasting Operations

The Occupational Safety and Health Administration (OSHA) writes and enforces regulations that govern safety and health practices in the work place, with many pertaining to cleaning and painting operations. Most of these regulations are very specific about how to do a job safely. Their purpose is not to make our job more difficult, but to make it safer. These regulations have been developed over many years through studies on how and why accidents happen, and following these written procedures and regulations should ensure that we don 't make the same mistakes that have injured others in the past.

This article will review some of the general requirements of regulations on abrasive blasting and explain how they can help increase job safety.

Hazards of Abrasive Blasting

When you blast clean surfaces with abrasive driven by air, you have to deal with several hazards to your health and safety. Some of these hazards can be lethal, so it is important that you understand what they are and observe the proper safety precautions. The hazards of abrasive blasting include, but are not limited to:

- dust,
- noise, and
- equipment.

Dust

The dust produced by abrasive blasting is a very serious health hazard. Dust results from the breakdown of abrasives and the pulverizing of surface coatings, rust, millscale, and other materials on the steel surface being blasted. The individual dust particles vary in size from 1 micron ($\frac{1}{25,000}$-inch) to 1,000 microns ($\frac{1}{25}$-inch) in diameter. Dust larger than 10 microns may be visible and settles quickly. Dust smaller than 10 microns, called respirable dust, is invisible, remains suspended in the air for a longer period of time, and can pass through the respiratory system's defenses and settle in the small air sacs in the lung called alveoli.

Dust of this size cannot be dissolved by

Editor's Note: This Applicator Training Bulletin is an update of an original article written by Walter Shuler, certified safety professional and safety consultant; Jeff Theo, Service Painting Company; and Mike McGinness, Custom Process Systems. The article was originally published in the June 1998 issue of Protective Coatings Europe (PCE) *and was updated for this issue by Dan O'Malley, Manager of the Environmental, Health, and Safety Group; and Stan Liang, Director of Health and Safety; KTA-Tator, Inc.*

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the lung fluids. Because the lung cannot break down or cast out the particles, it does the next best thing in its defense program, which is to isolate the intruder by building a thick, fibrous tissue around it. When too much of this tissue develops, the lung is said to be "fibrotic," or in a condition of fibrosis.

The routes of entry and the associated health effects depend on the chemical and physical properties of the dust. If the dust is soluble in water and respirable in size, it can enter the alveoli, pass through the walls of the alveoli in the lungs, and enter the bloodstream. Once in the bloodstream, dust can be transported rapidly throughout the body and damage various organ systems.

Other health hazards may be present in the dust produced by the abrasive blasting process. These hazards can result from the removal of coatings containing toxic metals such as lead, arsenic, cadmium, and hexavalent chromium. One of the most common toxic metal hazards encountered in the removal of a coatings system is lead, a toxic metal that can damage the body's blood-forming, nervous, urinary, and reproductive systems. Lead also accumulates in the body; thus, exposure to small doses over long periods of time can cause great harm.

Exposure to toxic metals can also directly affect the skin. Metals such as hexavalent chromium can irritate the skin or cause an allergic reaction. Other metals can have an irritant effect on the respiratory tract, such as pulmonary edema (fluid build-up in the lungs) caused by severe cadmium dust exposure. Entry can also occur via ingestion, typically caused by poor hygiene practices such as eating, drinking, and smoking in the work area.

To determine the specific toxic metals likely to be present in a coatings system, paint chip samples should be collected from representative areas of the structure. The metals that the samples should be analyzed for would depend on a number of considerations, such as the type of structure and the type of coatings system being evaluated. Sometimes, toxic metal content can be determined based on historical knowledge of the coatings system being evaluated.

Toxic metals can also be present in the virgin abrasive blast media, such as crystalline silica in silica sand abrasive. However, dust-containing crystalline silica also can be produced during other abrasive blasting activities, such as surface preparation of concrete. A study published in the September 2006 issue of the *Journal of Occupational and Environmental Hygiene* indicated that elevated exposure to crystalline silica exposure also can result when it is present in the coatings system being removed.[1]

The Safety Data Sheet should be consulted to determine what metals may be present in the abrasive blast media. Recently, OSHA has begun requiring abrasive manufacturers to list toxic metals in their products, even if they are present only in trace amounts. Arsenic is commonly found in steel grit and coal slag abrasives, while beryllium is commonly found in coal slag abrasives.

When there is exposure to toxic dust, the primary concern is to control respiratory exposure. Respiratory protection must comply with the OSHA Respiratory Protection Standard (29 CFR 1926.103). This standard requires feasible engineering and work practice controls to be employed before respiratory protection is used by workers. Engineering controls include ventilated abrasive blasting containments and considering alternatives to abrasive blasting, such as vacuum-shrouded power tools, water jetting, and chemical stripping. Job rotation is an example of a work practice control. Note that job rotation is not permitted by OSHA in all cases (if workers are exposed to hexavalent chromium, for instance). If such a control is used, a written schedule must be developed and followed.

Respiratory protection may only be used after engineering and work practice controls are employed and workers are still exposed above the OSHA Permissible Exposure Limit (PEL) for a given toxic dust. Employers must select, use, and maintain respirators in accordance with a written program (the elements of which are specified by OSHA in the Respiratory Protection Standard).

Blasters typically use a Type CE or helmet-type airline respirator. Workers in the vicinity of the blasting area, such as pot tenders and lookouts, are required to wear respiratory protection. Workers engaged in clean-up operations should also be equipped with respiratory protection. These workers are usually assigned a half-mask, air-purifying respirator with high-efficiency cartridges (labeled as N, R, or P 100). However, workers cleaning up abrasive blasting debris when blasting is still in progress (as is often the case when recyclable grit is used) may need a higher level of protection. Such workers may need to wear the same type of respirator as the blasters, as their exposure levels are likely to be similar.

The National Institute of Occupational

Safety and Health (NIOSH) conducts research on health issues in the work place, and one of its main functions is to test and certify industrial respiratory protection equipment. All respiratory protection equipment used in the workplace must be approved by NIOSH.

Respiratory protection should continue to be worn after blasting as long as dust-laden air remains. Respirable dust in an abrasive blasting booth or containment can remain suspended for long periods of time after blasting is finished. This time period is largely dependent on the effectiveness of the ventilation system, unless the work is performed outdoors.

A health and safety professional should review all projects that require abrasive blast cleaning to determine what precautions, if any, should be taken to eliminate the hazard of chemical exposure. Examples of these precautions include disposable clothing, boots, gloves, respiratory protective devices, and hygiene practices. Hygiene facilities that can be required by OSHA include hand wash stations and showers. OSHA requires provision of a hand wash station when workers may come into contact with toxic materials. Whether or not showers are mandatory depends on which OSHA standard is applicable. If workers are exposed to lead, showers are required when exposures exceed the PEL.

Noise

Most forms of abrasive blasting create the hazard of noise exposure, which will vary depending on the blasting conditions. Regardless of the nature, excessive amounts of noise may require personal hearing protection for blasters and other workers in the general area. Depending on the size of the equipment, the material being blasted, and the location of the blasting operation, noise levels can range from about 90 decibels to more than 110 decibels. OSHA's limit for noise depends on the duration of exposure. For an eight-hour shift of continuous exposure, the limit is 90 decibels. Personal hearing protection should then be recommended if the level and exposure time of the workers exceed the OSHA standard. Noise protection must reduce exposure to below the OSHA limit.

Note that some abrasive blasting hoods already provide some degree of noise protection, but the manufacturer's specifications should be checked to see if the degree of noise reduction will be adequate. When there is any question about the existing levels (meaning a noise survey is need-

ed) or the adequacy of hearing protection, a health and safety professional should be consulted.

Equipment

The equipment used in abrasive blasting operations can create physical hazards that require certain precautions. The following are some examples of equipment commonly used during the abrasive blast cleaning process and the respective precautions that should be taken during their use.

- "Deadman" control: This is usually a spring-loaded control located near the nozzle end of the blast hose. When depressed, it starts the flow of high-pressure air and abrasive. When released, it stops the flow. Deadman controls can be either pneumatic (air-operated) or electric. In either case, the control must be kept depressed by the operator for the system to work. This prevents a nozzle from blasting the operator or nearby workers with abrasive if dropped. Always verify that there is a Deadman control and that it is operable before any work is performed.
- Hoses: Hoses are subject to severe abrasion from the high-pressure air and abrasive that moves from the pressure vessel to the nozzle. Ruptures can cause serious injury. Metal piping carrying abrasive also deteriorates rapidly. Hoses and piping should be inspected on a regular basis and repaired or replaced periodically as necessary. Hose and pipe couplings also should be inspected regularly. Blast hose couplings should be wired together and whip checks should be used. Whip checks are safety cables that restrain movement of the hose should the coupling connection become compromised.
- Pressure vessels: Pressure vessels for compressed air or abrasive under pressure should be checked regularly because they are also subject to abrasion and deterioration beyond that of normal pressure vessels. Pressurized abrasive tanks must have a removable plate for internal inspection. All vessels must conform to American Society of Mechanical Engineers (ASME) boiler and pressure vessel codes.
- Valves: All valves and rubber valve parts are subject to wear and should be inspected and replaced periodically.
- Fill ports: Pressure vessels for abrasive blasting should have a funnel-shaped input that is easily accessible to the operator so that strain caused by lifting bags of abrasive is avoided.
- Hoseline grounding: Nozzles should be grounded because the air and abrasive can create enough friction to develop a

substantial charge of static electricity. This is most important while working inside tanks or in other areas where there is potential for explosion.

• Personal protective equipment: In addition to respiratory and noise protective equipment, blasters should wear apparel to prevent damage to their skin from abrasive blasting and ricochet. Such apparel includes safety footwear or toe guards, coveralls, leather or rubber capes, and gloves. Pant and sleeve cuffs should be secured with tape or other suitable fasteners. These clothing rules are most difficult to enforce during hot weather, but despite the discomfort, they still must be enforced. Protective equipment should be inspected daily and repaired or replaced as necessary. Clean storage areas should be provided for respiratory protection and protective apparel. It is most important that blasters receive proper training in the use of personal protective equipment.

Summary

When performing abrasive blasting, safety considerations must be given to hazards including dust, noise, and equipment. Once the hazards are determined, procedures for personnel protection can be developed. In addition to being provided with personal protection, workers must be properly trained in the use, inspection, and maintenance of equipment.

Procedures to control exposure to health and safety hazards must conform to the OSHA regulations that govern blasting operations. Additional regulations from state or local jurisdictions may be in force. Twenty-three states have their own version of OSHA, and their regulations are at least as strict and, in some cases, stricter than federal OSHA regulations.

This article should not be considered a comprehensive analysis of abrasive blasting health and safety. When there is any doubt about the nature of the hazard or how to protect workers, assistance should be obtained from a health and safety professional, typically someone who is a Certified Industrial Hygienist or a Certified Safety Professional or possesses a degree from a related field of study.

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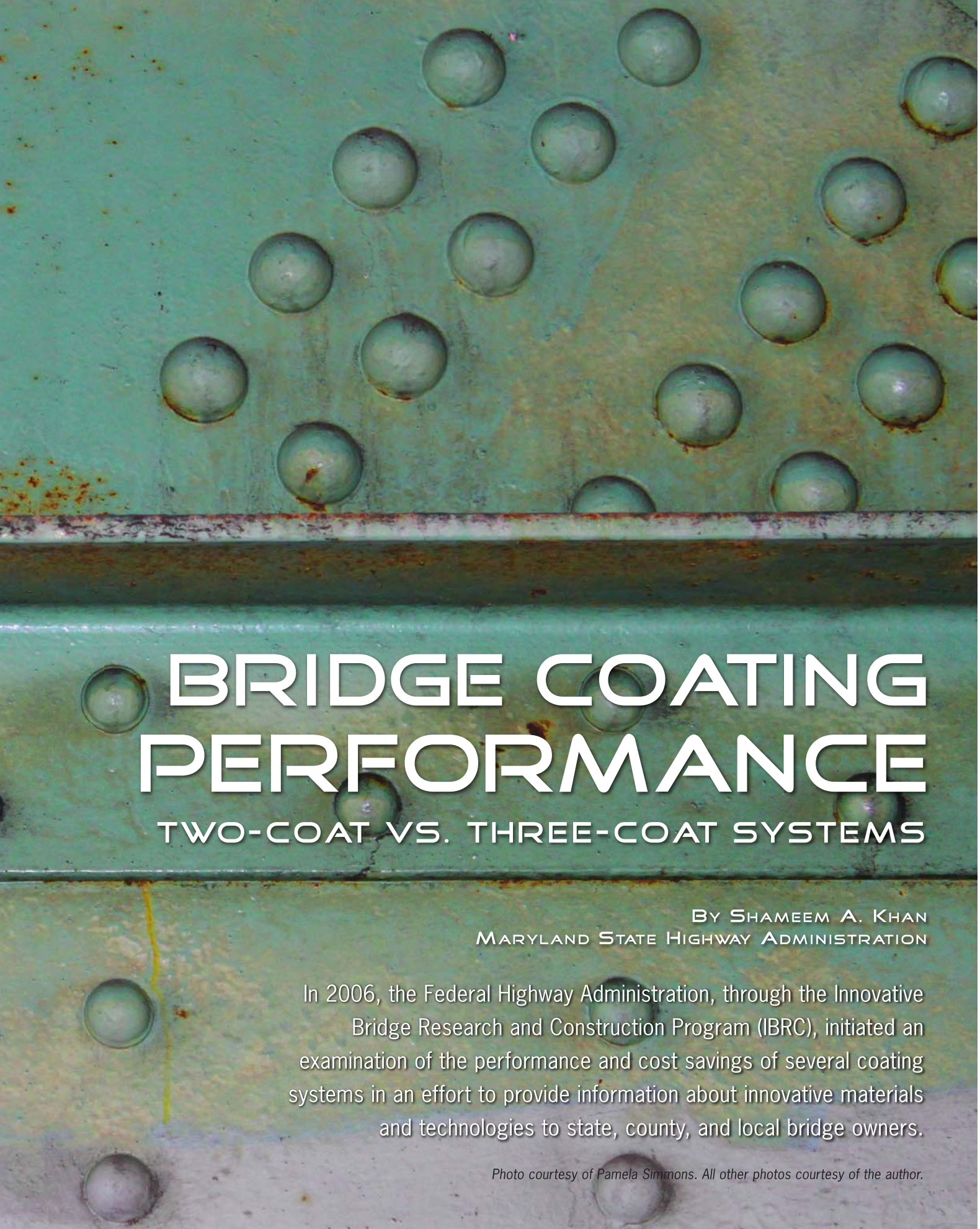
1. Meeker, John D., Pellegrino, Anthony, and Susi, Pam, "Comparison of Occupational Exposures Among Painters Using Three Alternative Blasting Abrasives." *Journal of Occupational and Environmental Hygiene*, Volume 3, Issue 9 (September 2006): pp. D80–84.



BRIDGE COATING PERFORMANCE

TWO-COAT VS. THREE-COAT SYSTEMS

By Shameem A. Khan
Maryland State Highway Administration

In 2006, the Federal Highway Administration, through the Innovative Bridge Research and Construction Program (IBRC), initiated an examination of the performance and cost savings of several coating systems in an effort to provide information about innovative materials and technologies to state, county, and local bridge owners.

Photo courtesy of Pamela Simmons. All other photos courtesy of the author.

The Maryland State Highway Administration (SHA) conducted a four-and-a-half-year performance evaluation that compared two different two-coat paint systems against its standard three-coat system, consisting of an organic zinc primer, a polyamide intermediate, and an aliphatic urethane finish coat (currently the "state-of-the-art" system for most states).

This article describes the results of various performance tests to determine which of the three coating systems would provide the best protection for bridge rehabilitation at the lowest cost. It will also break down the evaluation process step-by-step and explain the significance of each of the testing criteria.

Figs. 1 and 2: Bridge No. 0700300 in Maryland was selected because it provided three coating surfaces independent of one another, is in a humid environment, and suffers from leaky joints and an old concrete deck with high salt concentrations. Winter salt spray can penetrate cracks in concrete bridge decks. When the deck dries, the salt remains.

BRIDGE SELECTION

The bridge chosen for the research project was Bridge No. 0700300 on U.S. 1 over Octoraro Creek in Cecil County, Md. The bridge's composite steel and concrete structure contains two, 100-foot-long by 50-foot-wide spans.

This bridge was selected for the following reasons. (Figs. 1 and 2)

- It consists of three pairs of girders that have no structural connections between them. As a result, there would be no overlapping of any of the three coating systems being tested.
- The bridge is located in a humid environment, close to the Conowingo Dam on the Susquehanna River.
- The bridge has typical leaking joints and an old concrete deck that had exhibited saturation and high salt concentrations.

COATING SYSTEMS

The three coating systems selected (Table 1) were applied at specific locations defined in Table 2 and shown in the Framing Plan (Fig. 3). System C is the SHA's standard three-coat system used for maintenance painting of existing bridges. The two-coat systems, referred to as Systems J and K, were selected for comparison because of their use in the industry as alternative systems.

The Federal Standard 595 Color No. 24108 (dark green) finish coat was specified for all three systems. Stripe coating was also specified for all edges, corners, crevices, rivets, bolts, nuts, and washers prior to the application of all coats for each coating system. All coatings were applied according to the manufacturer's recommendations.

ABRASIVE BLAST CLEANING

All coatings were applied after abrasive blasting with steel grit, using the same blast cleaning standard, SSPC-SP 10/NACE No. 2, Near White Blast Cleaning. Prior to abrasive blasting, the steel was solvent-cleaned (localized) and then power-washed by high-pressure water cleaning at 5,000-6,000 psi.

Table 1: Coating Systems Tested

Coating Type	Coat	Dry Film Thickness (Mils), Min. - Max.	Usage
Coating System C			
Organic Zinc	I	3.0 - 5.0	Primer
Epoxy Polyamide	II	5.0 - 8.0	Second Coat
Aliphatic Urethane	III	2.0 - 3.0	Finish Coat
	Total Thickness	10 - 16	
Coating System J			
Elastometric Acrylic	I	7.0 - 12	First Coat
Elastometric Acrylic	II	7.0 - 12	Finish Coat
	Total Thickness	14 - 24	
Coating System K			
Zinc-Rich, Moisture-Cured Urethane	I	2.0 - 3.0	Primer
Polyaspartic Urethane	II	6.0 - 9.0	Finish Coat
	Total Thickness	8.0 - 12.0	

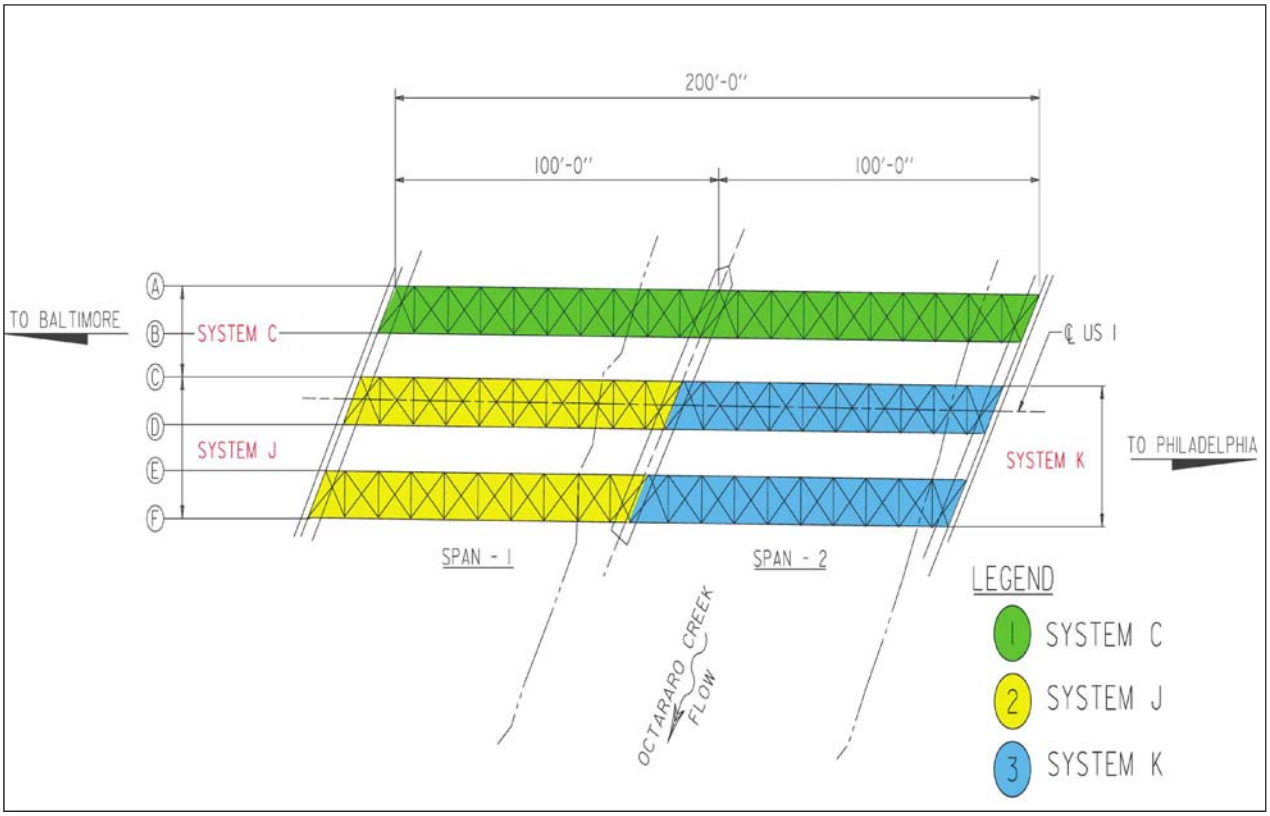


Fig. 3: The framing plan illustrates target areas for each coating system.

Table 2: Coating Systems and Test Locations

Coating System	Areas to be Cleaned and Painted
C	All steel surfaces of Girders A and B including cross bracings between them in both spans.
J	All steel surfaces of Girders C, D, E and F including all cross bracings between them in Span 1.
K	All steel surfaces of Girders C, D, E and F including all cross bracings between them in Span 2.

Table 3: Dry Film Thickness Data

Coating System	Test Area ID	System ID	DFT (Mil)	Average Mil	Specified (Mil) Min. - Max.
C	Top - Web	CT	12.4	17.62	10 - 16
	Middle - Web	CM	13.1		
	Bottom - Flange	CB	27.5 (above spec.)		
J	Top - Web	JT	21.0	18.76	14.0 - 22
	Middle - Web	JM	15.8		
	Bottom - Flange	JB	19.5		
K	Top - Web	KT	9.6	9.62	8.0 - 12.0
	Middle - Web	KM	9.1		
	Bottom - Flange	KB	12.3		

TESTING AND RESULTS

The areas to be cleaned and painted are described in Table 2. Testing plans, inspection procedures, and recording systems were established and performed during cleaning and painting operations.

Chloride Testing

Utilizing SSPC-Guide 15, *Field Methods for Extraction and Analysis of Soluble Salts on Steel and Other Nonporous Surfaces*, chloride and soluble salt determination was performed before pressure washing, after pressure washing, and immediately after abrasive blast cleaning. Chloride test results at 48 previously-marked locations were as follows.

- Before pressure washing all sites were less than or equal to 5.3 µg/cm.
- After pressure washing all sites were less than or equal to 1.2 µg/cm.
- After blast cleaning all sites were less than or equal to 0.4 µg/cm.

pH Testing

A pH test determines the presence of acid or alkali on a steel surface after blast cleaning. A properly cleaned surface should be free from any alkali or acid contamination.

The pH testing was performed on the blast-cleaned steel prior to the application of the three coating systems. The test was performed every 500 square feet.

Pure water is neutral with a pH value of 7. Values less than 7 indicate acidity and values greater than 7 indicate alkalinity. The pH test results ranged from 5.75 to 6.5 on all cleaned steel surfaces of the girders.

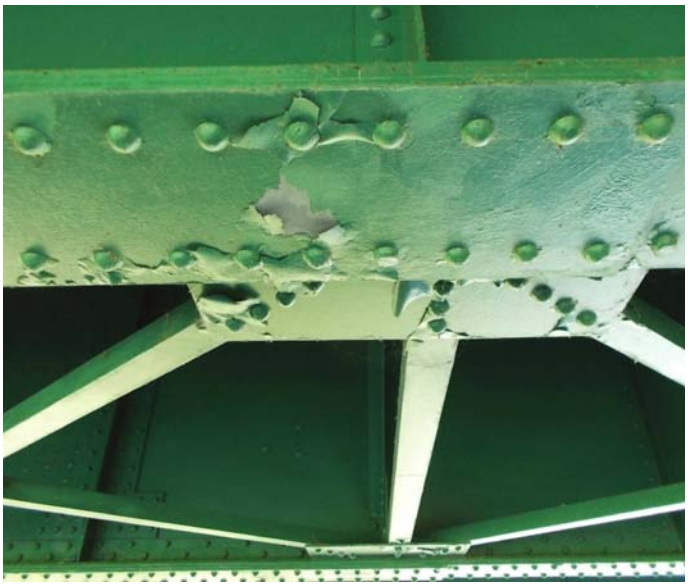
Surface Profile

Using replica tape (per Method C of ASTM *D4417 Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel*), tests were performed every 200 feet of cleaned surface area on each girder. The specified surface profile was to be in the range of 1.5 to 4.5 mils. With an average of 3.67 mils obtained in 104 measurements, no location was above or below the specified limit.

Adhesion Testing

After coating application, two different adhesion tests, pull-off testing and cross-cut testing, were conducted to assess adhesion between coatings and substrates and between coating layers themselves.

Figs. 4 and 5: Coating System J, the elastomeric acrylic, showed blistering, peeling and corrosion on approximately 20 percent of the total surface area.



Figs. 6 and 7: Coating System K, the zinc-rich moisture-cured urethane and polyaspartic urethane showed rust, peeling and cohesion failure on approximately 10 percent of the total surface area.

Pull-Off Testing

This method measures tensile stress and is done by securing loading fixtures (dollies) perpendicularly to the surface of a coating with an adhesive. Adhesion test readings were in the range of 300 to 600 psi. All measurement results were above the acceptable range of 200 psi.

Cross-Cut Testing

The cross-cut test determines the resistance of paints and coatings to separation from substrates by utilizing a tool to cut a right-angle lattice pattern into the coating, penetrating to the substrate.

One X-cut test reading using tape (supplied with a kit, per ASTM *D3359, Method A*) was taken at each test location. All of the edges of the cuts were completely smooth; none of the squares of the lattice were detached.

Dry Film Thickness Testing

To measure the thickness, 15 readings consisting of five blocks measuring 1½ square

inches, were distributed throughout a 100-square-foot surface area of steel. The average thickness of the spot measurement for each area was to be no more or less than the specified thickness range.

Dry film thickness test results are shown in Table 3 (p. 36). All dry film thickness readings met the specified range, except at one location in system C.

VISUAL INSPECTION

Visual inspection after 55 months revealed the following.

- Coating System C performed the best of the three systems, with only 2 percent failure and showing minor corrosion on some edges. This system retained its integrity and did not show any areas of peeling, blistering, or cohesion failure.
- Coating System J showed areas of blistering, peeling, and corrosion on approximately 20 percent of the total surface area (Figs. 4 and 5, p. 38).
- Coating System K showed areas of rust, peeling, and cohesion failure between the primer and the finish coat on approximately 10 percent of the total surface area (Figs. 6 and 7, p. 38).

CONCLUSIONS

While the purpose of using two-coat systems is to reduce painting costs, this research indicated that the two-coat systems tested over blast-cleaned surfaces were not cost-effective when compared to the traditional three-coat system.

System C, the standard three-coat system presently used on existing bridges in Maryland, continues to be the best performing paint system, according to this research project.

During cleaning and painting operations, the project had full-time, third-party inspection, with periodic visits by SHA office staff. These inspections ensured that the contractor performed all activities in accordance with the required project specifications.

ABOUT THE AUTHOR

Shameem Khan has been working as a project manager in the coating design section of the Office of Structures for the Maryland State Highway Administration for 21 years. He has a Bachelor of Science in civil engineering and possesses NACE Levels I, II, III, and National Highway Institute certifications. Mr. Khan was awarded the Maryland Quality Initiative Award of Excellence in 2009 for the project design of the protective coating of the American Legion Bridge over the Potomac River. He has also participated in overcoating and rapid deployment research work through the Federal Highway Administration's research programs. JPCL

The City of Eagle River, Wisconsin's 300,000-gallon spheroid elevated water storage tank received periodic maintenance as part of a ten-year design-build contract.
All photos courtesy of the author.

Maximizing Water Tank Service Life Using a Design-Build Approach

By Daniel J. Zienty
Short Elliott Hendrickson Inc. (SEH)

They say there is more than one way to skin a cat. That same analogy holds true when considering the maintenance of a water tower. There are numerous approaches including direct selection, traditional design-bid-build, and design-build. Each approach holds merit, and before making the selection, an owner should carefully weigh the advantages and disadvantages of each. Some of these advantages and disadvantages are discussed in a previous article, "Old Tanks, Small Towns, Tight Budgets" (*JPCL*, May 2005).

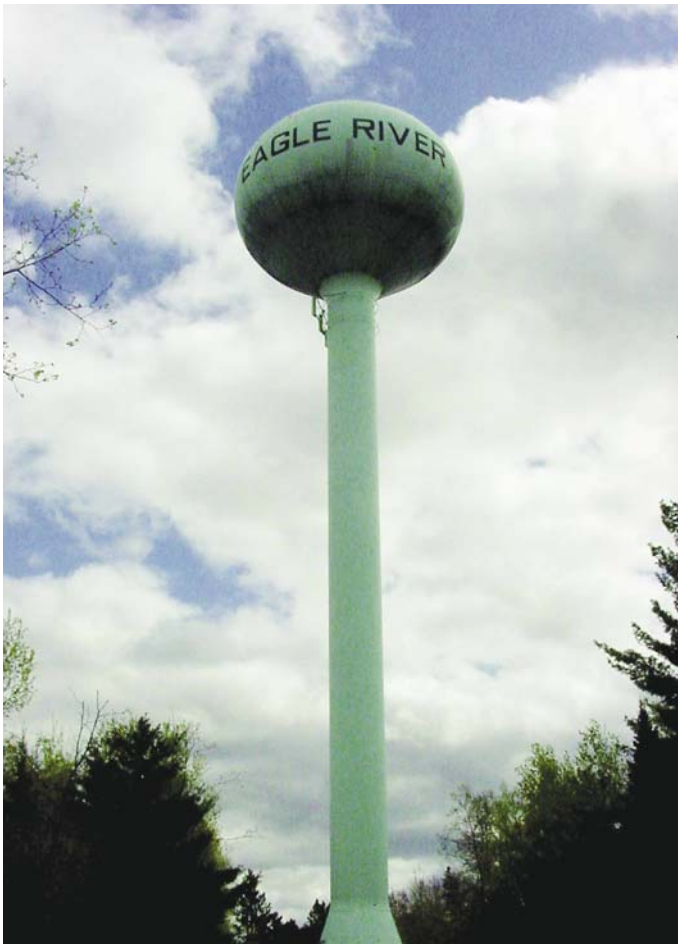
The sole purpose of selecting from any of the above approaches is simple: to maximize the service life of the water tower's applied coating system. Selecting an approach may be easier when the scope of work is based on the complete reconditioning or restoration of the facility. The contractor begins with a clean slate, and it is easy to identify where the responsibility lies should there be a premature failure. However, often times this approach is just not possible, and what may be referred to as aggressive maintenance is warranted at the system's approximate half-life.

In 2006, SEH embarked on the design-build method of delivery for water storage tanks, and partnered with a Midwestern contractor. One of the first projects in the program was a 300,000-gallon water spheroid in the City of Eagle River, Wisconsin (referred to from this point forward as "the City.") The tank was last painted in 1991, making the existing coating system 15 years old. The first step prior to developing the project proposal, was conducting a comprehensive inspection of tank surfaces in accordance with AWWA D101, including interior immersion, interior dry (access tube, riser, and base), and accessible exterior areas. Tank appurtenances were also evaluated for compliance with current AWWA and OSHA requirements.

This article will review the design-build approach to developing and executing a maintenance plan to maximize the tank's coating system service life even beyond the recommended 15 to 20 years.

Tank Evaluation and Proposal

The inspection performed by SEH identified an immediate need for complete removal and replacement of the interior immersion coating system, and spot repairs for the interior dry sections including the bottom bowl and platforms. The exterior also exhibited a need for spot-coating repairs and a complete overcoat, its condition verified by a 3A average result using adhesion testing. This would be preceded by a complete power-wash to remove loose coatings and



Before the summer of 2006, the tank had not been coated since 1991, making the original coating system 15 years old.

In the summer of 2006, the tank received repairs and rehabilitation, including a new color scheme and logo.

other surface contaminants. Structural modifications would include a frost-free roof vent, an additional roof manway, a new handrail system, and a mud valve for draining the bottom bowl.

Next, the team developed a proposal and work order that outlined the specifications and materials to be used for the immediate work based on the results of the field inspection. Further, a service schedule was developed inclusive of subsequent inspections and follow-up servicing of the facility during the term of the agreement. For the City, the effective period of the agreement spanned ten years.

It should be mentioned that expected service life of coating systems for water storage tanks is 15 to 20 years when periodic inspection and maintenance are completed. Though owners may include a maintenance schedule for these operations to take place, in many cases other activities of immediate need take precedence, and maintenance is held off until it is past the point of maintenance, and reconditioning is warranted. One of the key advantages to a design-build approach is that it includes regularly scheduled inspections and maintenance.

The service schedule, as presented to the City, included the completion of all major repairs as identified above in the first year of the agreement, scheduled for the summer of 2006. An annual visual survey would be conducted by a NACE- or an SSPC-certified inspector each year from 2007 through 2010. The 2010 survey would be completed following general maintenance (work identified in 2009). Finally, visual surveys would be conducted in years 2011 through 2014, with final maintenance completed in the agreement's final year, 2015. At that time, the City has the option to renew its contract following a final evaluation. The design-build approach provides the City with both planned periodic tank maintenance and budget forecasting.

Initial Works Begins

In May of 2006, the contractor mobilized and began rehabilitation of the tank. Interior immersion surfaces were abrasive blasted to a Near White level of surface cleanliness (SSPC-SP 10). This was followed by the application of two coats of a modified epoxy meeting NSF Standard 61. The interior dry surfaces were equally spot-blasted to a Near White finish (SSPC-SP 10), with edges feathered to provide

for a smooth transition, and affected areas were coated with the same system as the immersion surfaces.

The tank's exterior surfaces were power washed to remove loose paint and inherent dirt and mildew. Spot areas exhibiting rust or corrosion, which included about 20% of the total surface, were mechanically cleaned to an SSPC-SP 11 finish (Power-Tool Cleaning to Bare Metal). Spot areas were feathered similar to interior dry surfaces in order to provide a smooth transition for the epoxy primer and intermediate coat. Finally, the tank was overcoated with polyurethane using two colors and incorporating a logo.

As the design-build approach was used, placing the tank under a full warranty for product and contract labor for 10 years, inspection by a NACE- or an SSPC-certified inspector was limited to periodic observation at hold points, with emphasis on surface preparation and prime coat application. The tank was completed and placed in service at the end of June 2006.

After power washing, exterior tank surfaces were mechanically repaired, spot primed, and overcoated during the first round of maintenance in 2006.

The tank's interior immersion surfaces, including ladders and other appurtenances, received 100% reconditioning in 2006.

By 2010, tank immersion surfaces were exhibiting staining and sediment build-up, requiring power washing and sediment removal.

After power washing in 2010, the coatings on the interior immersion surfaces appeared to remain in good condition.

Though the 2013 visual inspection found some areas of iron staining on the interior, there was no apparent damage to the coating system.

Visual Inspections

Subsequent visual surveys were completed on the following dates:

- May 14, 2007;
- July 29, 2008; and
- August 24, 2009.

In 2010, the contractor completed general maintenance as identified in the service schedule included in the City's agreement. This work included power washing using heated water and 3,500 psi pressure to remove dirt and mildew developing at the cone section

After equipment upgrades in 2013, touch-up areas and some dirt on the lower bowl were visible on the tank's exterior.

of the bowl. They also rinsed the tank immersion area and removed two to three inches of sediment from the bottom bowl. At this time, the expansion joint was also replaced. It was also noted that portions of the exterior system were starting to fade and lose gloss (not considered a system failure, but associated more so with color selection). Inspection of the completed work was made on May 26, 2010.

Again, SEH conducted visual surveys on the following dates:

- October 27, 2011;
- October 4, 2012; and
- September 12, 2013.

As part of the original agreement, any additions to the tank (e.g. telecommunications equipment) required review and inspection by SEH, and any coating repairs were to be made by the contractor. The purpose of this was to maintain consistency in workmanship for the in-place warranty. In 2013, an equipment upgrade was made by one of the tenants, and the contractor was on-site to complete repairs following installation of new penetrations at both the base of the tank and beneath the bowl. At this time, spot repairs were made on the exterior at the base, and in areas accessible

without special rigging. These spots were warranty-related and attributed to abrasions with subsequent undercutting that were exhibiting rust.

The annual visual survey was conducted during the completion of this work. Observations indicated continued good performance of the coating system in the tank's interior immersion area. Interior dry maintenance work would be required at the two platforms. Most importantly, though, was that the exterior system was showing a significant breakdown, with numerous indications of spot cracking and peeling. This was prominent at the roof radial plates.

Moving Forward

The overcoat is now eight years old, the total system 23 years old, and two more years remain on the City's maintenance agreement. The recommendation made in the 2013 survey to the City was for final maintenance work to be completed in 2014 by the contractor. Completion of this work would provide some remaining aesthetic value but, more importantly, would protect currently exposed surfaces. This work would take the tank through 2015, when a final visual survey would be conducted to determine long-term restoration of the facility.

Conclusions

For the City of Eagle River, the design-build approach resulted in a successful project. At a cost of $265,000 over the length of its agreement, the City extended the service life of the coating system past the standard expectation of 15 to 20 years. Additionally, the tank's interior, reconditioned in 2006, has service life still remaining. Finally, through its duration, the City was assured that the tank was being annually monitored and periodically maintained, exceeding the guidelines set forth by AWWA and the Wisconsin Department of Natural Resources (WisDNR). Without the design-build approach, the responsibility for continuous maintenance rests with the City and an annual budget. It is a budget where adjustments must be made to consider other system priorities and address emergencies.

With respect to project risk, the risk lies with the company providing the service. Therefore, it is most important that the initial facility evaluation be conducted by an experienced inspector, that the investigation is comprehensive, that historical information is provided, and that field testing in accordance with current applicable standards is done accurately.

The results must then be assessed by both the engineer (SEH) and the partnering contractor—in this case, Classic Protective Coatings, Inc. (Menomonie, Wis.). To this end, project risk can at the very least be minimized, resulting in a successful project.

About the Author

Dan Zienty has served as a Protective Coatings Specialist at SEH for more than 15 years. He has a Bachelor's degree in construction technology from Purdue

University and holds several certifications, including NACE Coatings Inspector, SSPC Protective Coatings Specialist and Supervisor for Deleading Industrial Structures. He has received numerous Engineering Excellence Awards from the Consulting Engineers Council of Minnesota for his work on water tower restorations, and has authored and presented related articles on protective coatings maintenance. Zienty is an active member of SSPC and the treasurer of the North Central Region Chapter of SSPC. JPCL

Coating Maintenance Planning to Ensure Reliable Water and Power Delivery

By Dr. Bobbi Jo E. Merten;
Richard Pepin, PCS;
Dr. David Tordonato, P.E.; and
Dr. Allen Skaja, PCS
Bureau of Reclamation

The Bureau of Reclamation is responsible for delivering raw water and power in the country's 17 western states. Reclamation infrastructure provides irrigation water to 25% and 60% of the nation's fruit and vegetable crops, respectively. This water also reaches 31 million people for municipal, residential, and industrial uses. In addition, Reclamation contributes to 17% of the nation's hydropower through 53 owned and operated hydroelectric power plants, including the Grand Coulee Dam in Washington (Fig. 1), the Hoover Dam in Nevada, and the Buffalo Bill Dam in Wyoming. It is vital to ensure that this water and power delivery is continued and reliable.

The successful operation of this very large and complex infrastructure requires careful coating maintenance planning. Reclamation's assets include small to extremely large facilities (Fig. 1); hard-to-access areas such as confined spaces, remote locations, and rough and steep terrain (Fig. 2, p. 54); and atmospheric, immersion, or fluctuating immersion exposure conditions (Fig. 3, p. 56). Each scenario affects the maintenance plan, and creative solutions are often required to arrive at a cost-effective approach.

This article describes the strategies used by Reclamation's facility personnel and coatings specialists to inspect, repair, and recoat coated infrastructure. The focus is restricted to hydropower facilities but translates well to other infrastructure. The authors conclude with basic details one should consider when developing a coatings maintenance strategy.

Fig. 1: Above-ground penstock/discharge tubes at the Grand Coulee Dam and John W. Keys III Pump-Generating Plant in Washington. All photos courtesy of U.S. Bureau of Reclamation.

Fig. 2: The Flatiron Penstocks (Loveland, Colo.) feature a long pipe span and a rugged slope at a 15-degree incline.

Hydropower Facilities

Maintenance planning for hydropower facilities and water transmission equipment originates from an understanding of the basic components and routines of these facilities. The coated metalwork begins at the intake gates or trash racks, generally within a reservoir behind a large dam. The water is carried from this reservoir to the power plant via one or more penstock pipelines (Fig. 4, p. 56). The lengths of these pipelines range from hundreds to thousands of feet.

The water flows through the penstock (Fig. 4) and into the scroll case (Fig. 5, p. 58), which directs the water through the power-generating turbine runner. It then flows into a draft tube (Fig. 6, p. 60), where it is discharged to the river downstream of the dam.

Much of Reclamation's water is delivered for agricultural irrigation, restricting maintenance outages to the winter months. However, water delivery may still be required to meet obligations. This typically limits construction operations to one unit at a time—or several in the case of facilities with many units.

Coatings Inspection

Maintenance decisions often rely on observations made during coatings inspections, which are performed periodically by Reclamation facility personnel. For the waterway and other limited-access areas, this detailed inspection is often restricted to the facility's scheduled outage. The inspection goal is to assess the general condition of the coating by visual techniques. If corrosion, cracking, or blistering is detected, photographs and written comments are used to document the location and extent of the damage.

Figures 4–6 give insight to the complexity of existing systems at Reclamation facilities. In order, they show an embrittled coal tar enamel coating at the end of its useful service life; a spot-repaired coating system with visible corrosion of the leading edge of stay vanes; and a delaminated epoxy (turbine runner blade tips) adjacent to coal tar enamel overcoated with degraded paint (below turbine runner)—both experiencing cavitation damage.

Reclamation's Technical Service Center (TSC) provides coatings specialists to field locations at the request or need of its facility managers. The inspection team should include facility staff to combine the knowledge and experience of each party and to ensure a comprehensive analysis. A balanced inspection determines the following:

- infrastructure history and specifications—previous repair records, problem areas, and construction challenges or limitations;
- condition evaluations—visual defects, film and ultrasonic thickness testing, hazardous materials testing; and
- engineering options and recommendations—spot repair, overcoat, and recoat.

It is customary to include hazardous materials testing during inspection, especially when maintenance actions are likely to follow. A certified laboratory performs the analysis, and the results dictate the applicable containment and disposal regulations. Often, the confirmation of hazardous materials in the existing coating impacts the decision-making process for coating maintenance.

The results and recommendations of any TSC inspection are provided to the facility in an official report. A good inspection report incorporates the facility owner's perspective into this process in order to ensure that the recommendations are feasible. For example, spot repairs may be recommended for severely corroding areas when it is known that funding cannot be secured to perform total coating replacement in the near future.

Maintenance Options

Coatings maintenance recommendations can be divided into four main categories:

- deferral of maintenance;
- spot repair;
- spot repair with full overcoat; and
- complete coating removal and replacement.

Each of these options is progressively more complex and requires increasingly more work, all at additional costs. Respectively, each option also offers greater long-term protection to the structure.

Deferral of Maintenance

Coating maintenance is deferred for an existing coating system in good condition, for a structure with limited service life, or if there is some other benefit to postponing the work. It becomes costly to defer coating maintenance where extensive corrosion is present because the level of surface preparation required

increases correspondingly. Eventually, total removal will be the only remaining option.

A structure that is corroding extensively but is structurally sound may have deferred maintenance because the highest level of surface preparation (abrasive blast cleaning) is already needed, whether performed today or several years from now. The strategy in this case is to allocate the money to repair coatings on other structures that are not so badly deteriorated in order to prevent the coating degradation from reaching the point that total removal is the only option for those structures as well.

Fig. 3: Reclamation transferred works, which includes a radial gate structure with fluctuating immersion exposure

Spot Repairs

Spot repairs, as the name suggests, limit surface preparation and coating application to the individual locations of corrosion or coating breakdown. Coatings in any condition may be spot repaired, but it is only practical when the coating damage is minor and somewhat isolated. Surface preparation should proceed 1–2 inches beyond the perimeter of the intact coating to give a feathered edge. Aesthetics are compromised because these repairs are often visible. A variation of spot repairs, zone or area repairs, is for larger, well-defined portions of a structure that may receive more damage than other areas, such as a pipe invert or the waterline of a gate. These types of repairs can significantly extend the life of a coating system that is otherwise in good condition.

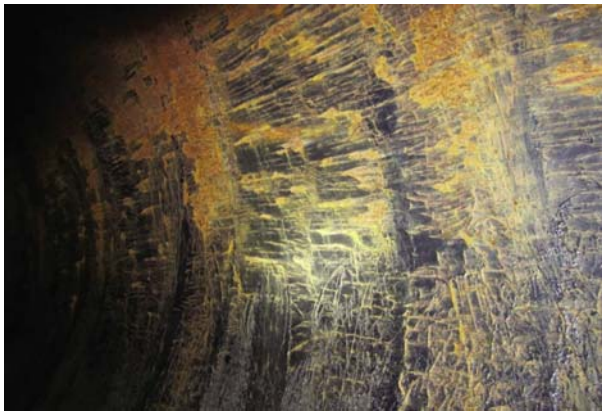


Fig. 4: Interior surface of an 8-foot-diameter penstock coated with coal tar enamel, showing severe cracking

The total spot repair area is estimated during the inspection. Photos of representative coating condition can be further analyzed during the report preparation, and total coated area (intact and degraded) is calculated using Reclamation's construction drawings. The rule of thumb is to use spot repair when the degraded area is 15% or less than the total surface area. Note that the spot repair area could be significantly underestimated for surfaces covered in mud or dirt, in the absence of adequate lighting, or inspected from a distance. This can result in expensive contract modifications during construction. This rule is somewhat flexible, and projects with hazardous materials, restricted location, and difficult accesses make higher percentages of repair areas economically feasible.

The cause of coating degradation should be a primary consideration. Widespread or randomly distributed degradation should be approached with caution, even when the damage represents a small fraction of the total area. If the coating is nearing the end of its useful service life, spot repairs may be a short-term solution. This may still be a practical approach to temporarily preserve the structure until more comprehensive maintenance can be performed.

Spot Repairs with Full Overcoat(s)

The application of a full overcoat serves two primary purposes: the fresh coat provides additional barrier protection, and it helps to seal minor defects that are not apparent when conducting inspections or spot repairs. It also offers improved appearance compared to spot repairs. However, the overall project complexity and cost increase because a contractor must now gain access to all areas of the structure to apply the full coat. The existing surface must also be thoroughly cleaned (i.e., power washed) to remove chalk and surface debris.

This strategy is also used when the amount of visible corrosion and coating deterioration covers less than 15% of the surface but has

the same cautions and flexibility described in the previous section on spot repairs. The adhesion of the existing coating to the substrate must be intact; otherwise, the stresses imparted by the overcoat can cause disbonding of the existing system, especially under freeze-thaw conditions. The compatibility of overcoats is examined using one or more test patch areas prior to construction. In some cases, two full overcoats are applied, keeping in mind that the total number of overcoats may be limited due to additional weight and stress. Unfortunately, overcoats are not typically considered for immersion service.

Fig. 5: Scroll case, stay vanes, and wicket gates with previous spot repairs

Total Removal and Replacement

Total removal and replacement is the most comprehensive option for coating maintenance. It is the most costly option (especially when removing existing coatings containing hazardous materials), but it offers the greatest opportunity for long-term protection. All mill scale, rust, and paint is completely removed and a new system with a new design life is applied. Coatings containing hazardous materials are removed at the same time, alleviating future concerns and responsibilities. This method is aesthetically pleasing.

The Ideal Maintenance Cycle

When total removal and replacement is performed, a new maintenance cycle begins. As the coatings age and weather, isolated spot repairs will be required. Several rounds of spot repairs may be made to the individual structure until the first full overcoat is necessary. More spot repairs and additional overcoats may again follow until significant coating breakdown occurs or the adhesion degrades to the point where additional spot repairs or overcoats are no longer practical. At this time, complete removal and replacement may again be required. The maximum effective life of the original coating system has been extended through these planned maintenance activities.

Coatings Maintenance Project Progression

A coatings maintenance project can range from a small area of spot repairs that is easy to access to a total removal and replacement with all the worst-case scenarios: complex infrastructure, hazardous materials, confined space, remote location, and so on. The following sections are dedicated to the process of performing contracted coatings maintenance.

Scope Definition

TSC coatings specialists work with infrastructure managers to define the project scope. Recommendations within inspection reports typically serve as a starting point with additional refinements as needed. The goal is to provide a scope that is as clear and comprehensive as possible before beginning the project specification work.

Coatings Specification

The coatings specification will serve as the official and legal directive for the contractor during construction. A complex coatings project may involve several engineering disciplines to write specification sections, especially when structural and/or related work is to be included. Examples include cavitation weld repairs prior to recoating and the repair or replacement of mechanical components such as valves. The specification package may require several reviews as well as valued engineering (VE) studies or similar prior to finalization.

Construction Support

Once the specification has gone out for bid and a contract is awarded, the TSC coatings specialists assist with the contractor's specification compliance. This includes the review and response to contractor submittals for coating products, applicator qualifications, and related items. The facility's managers have a representative on-site during construction for inspection and oversight. It is important that all parties know and understand their responsibilities prior to work commencing and that the procedures for addressing complications are mutually agreed upon.

Reclamation's Coatings Maintenance Challenges

As with any sector of use, coatings maintenance at Reclamation has overarching challenges. Below are some of the most prominent considerations.

• Coatings maintenance typically occurs in the winter to accommodate water delivery

Fig. 6: Turbine runner and draft tube with coating and cavitation damage

schedules. Selected coatings products must be appropriate for anticipated weather conditions.

• Coating maintenance within dam structures often occurs in high humidity, and amine blush is a potential concern with epoxy coatings.

• Quick-curing and underwater cure coatings are growing in demand as water delivery schedules become less flexible, also affecting surface preparation techniques. For instance, some Reclamation canals are not dewatered, causing lining crack repairs to be performed underwater. In addition, critical infrastructure, such as valves, may have a maximum inoperable time of 24 hours.

• Some of Reclamation's waterways have firm requirements for coating toxicities and volatile organic compound (VOC) compliance. A coating for potable water is one common request. Fish hatcheries are another example—zinc-containing coatings must be avoided in these areas.

Developing a Coatings Maintenance Strategy

Coatings maintenance plans have many challenges. For instance, it is tempting to overlook architectural coatings, especially when the reliability of other systems—hydroelectric power and water delivery, in this case—are public priorities. Similarly, the old coatings systems (coal tar enamel, lead, vinyl) offered substantial service lifetimes compared to their modern replacement coatings. These new maintenance cycles may occur at much shorter timescales for Reclamation facilities. This makes it all the more important to develop and institute a maintenance program.

Prior to an initial coatings inspection, it is important to review records regarding the coating system type, age, and previous maintenance. In some cases, maintenance records are not available or are non-existent. Utilize as many resources as reasonable, and keep in mind that some of the most valuable information may come from personnel experienced with that infrastructure, although increasing staff turnover poses a challenge. It is essential to carefully document key details in the inspection records for future use by the organization.

The following are several key questions that will assist in developing a good maintenance strategy.

• What is the funding source for coatings maintenance and what are the budgeting capabilities for regular coatings inspections, repair work, and replacement? The answer to this question forms the basic structure of an organization's maintenance strategy. When possible, small and regular contributions to coatings inspections and spot repairs can effectively delay a complete replacement for years to decades.

• What type of infrastructure requires protection? Is there a single substrate type such as steel, aluminum, concrete, wood, or other? Most facilities are complex and are likely to have several types of surfaces that are coated.

• What exposure(s) does the coated infrastructure receive? Common exposures are atmospheric, immersion, or buried, as well as fluctuating atmospheric/immersion and chemical.

• Are there special construction needs to consider? How accessible is the coated infrastructure and can it be recoated without interrupting operations? Does the present coating contain hazardous materials? Hazardous materials, confined spaces, or strict outage windows can cause the total coatings project costs to overwhelmingly surpass the actual coating material costs.

Summary

The Bureau of Reclamation owns and operates a large and complex network of water infrastructure including dams, hydroelectric power plants, canals, pipelines, and ancillary equipment. Like many organizations, Reclamation faces challenges associated with maintenance and upkeep of aging infrastructure. Budget constraints, environmental restrictions, escalating maintenance costs, accessibility, and operational demands are typical challenges of many facility owners today.

Coating service life extension is achieved by determining the most cost-effective long-term maintenance strategy, which includes combinations of deferral of maintenance, spot repairs, overcoating, and complete recoat. Planning and budgeting for future coatings maintenance

activities and inspections is crucial to a successful coatings maintenance program.

About the Authors

Bobbi Jo Merten joined the Bureau of Reclamation as a Coatings Specialist and has been involved with various projects, including the evaluation of coatings for zebra and quagga mussel mitigation, Reclamation infrastructure sustainability research roadmapping, and the development of electrochemical impedance spectroscopy (EIS) field evaluations. She holds a Ph.D. in coatings and polymeric materials.

Richard Pepin is a Senior Coatings Specialist with the Bureau of Reclamation, with over 28 years of experience, 14 of which are in the field of protective coatings. He is an SSPC-certified Protective Coatings Specialist, a NACE-certified Coatings Inspector Level 2, and holds a BS degree from Montana State University. He performs coating failure analyses, coatings system recommendations, specification preparations, and project management for a variety of water and hydropower generation projects.

David Tordonato is a Materials Engineer with the Bureau of Reclamation and works in the Technical Service Center's Materials Engineering and Research Laboratory. He holds BS and MS degrees in mechanical engineering and a Ph.D. in materials and metallurgical engineering. He is a SPRAT-certified engineer and frequently performs engineering assessments and other work on the inaccessible features of Reclamation Dams and equipment using rope access methods.

Allen Skaja joined the Bureau of Reclamation as a Coatings Specialist. His experience is in evaluating coatings for corrosion protection and testing coatings to deter the attachment of zebra and quagga mussels. He has a BS in chemistry and a Ph.D. in coatings and polymeric materials. **JPCL**

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Getting to "No:"

How to Ask the Difficult Questions First

By Warren Brand, W Brand Consulting

In 2011, I found myself turning 50 and having to start over in a new career—an unfortunate trend in today's economy. I have three daughters; the oldest is a freshman in college. My wife works full time for a school district, and we needed a second income.

In starting my new company, I had to make the challenging transition from contractor to consultant. Fortunately, decades of hands-on, practical work combined with an MBA in entrepreneurship as well as various certifications, made the transition manageable.

But, as in any new venture—especially if you're self-employed—getting your first clients is the most critical and the most frightening part. There were many days when I found myself staring at my computer screen, after making dozens of calls and sending dozens of emails, feeling a sense of panic that nothing I had done was working.

I had, however, managed to pique the interest of a large entertainment company that was working on a multi-billion dollar construction project overseas. The coating requirements, due to the environment, domestic labor force, and many other variables, were highly challenging. I was certain that we could not only help this company with the specific project they had in mind, but also could save them millions globally by changing some of their practices. In my

opinion, comparatively, our fee would be a pittance.

My contact at the company—I'll call him Larry—was always very pleasant and supportive. I spent weeks calling and emailing him. The only product I had to sell was my time—and I was spending enormous amounts of it on this one account.

Finally, Larry's company agreed to fly me out to the West Coast (all travel expenses paid) to make a presentation.

The meeting, which was scheduled for one hour, lasted for nearly two. I finally thought, "This is it. All of the hard work, emails, calls, presentations, were finally going to pay off."

But, when I got back to Chicago, Larry and I fell into the same pattern: pleasant emails and phone calls without forward momentum and, most importantly, without a commitment.

About the same time I was speaking with a work friend who had his own marketing research firm. He told me that he had just gotten off of a conference call where he was told his client would not be using his services. Our conversation went something like this:

"Hey Jack, I'm really sorry to hear the bad news. You must be really disappointed."

"Are you kidding me? That's great news!" Jack said enthusiastically.

"How is that great news? You said you just lost the account."

"Because I can now focus on other opportunities. I'm not in limbo anymore." We spoke a bit more, and as we spoke, I became more and more intrigued, and then finally, enlightened.

In doing the math, I realized that I had spent roughly 500 hours chasing Larry's account, yet I had accomplished nothing. Even at a modest fee per hour for my time, this one account cost me $25,000.

I then sent a proposal to Larry, which included a request to be paid a retainer. The email went something like this:

"It has been a pleasure working with you these past few months, and I remain certain that we can provide value. I've attached a proposal for your review and will follow up with you to inquire about your thoughts."

I called a few days later and Larry said he liked the proposal very much and definitely saw the value in our services. But then I asked the tough question that I should have asked months ago: "Do you have funds at this time to move forward?"

Finally I got the "no" that I should have asked for about eight months earlier.

It felt like a huge weight had been lifted from my shoulders. We ended on excellent terms, and I touch base with him once every six months or so.

The concept of getting to "no," and asking critical questions up front, has changed and refocused the way I do business.

For example, I was contacted by a company that wanted me to assist on a rather involved project. The company wanted to private label a cleaning product, however, the manufacturer had declined. I

was asked to either assist in identifying an alternative cleaning product, or assist in reverse-engineering the existing product.

After a few emails and conversations (that took no more than an hour of my time), I sent an email explaining that I would need a small retainer in order to continue discussions. Here is an excerpt of the response: "…there is not enough money in the world to pay retainers to all those consultants who believe they can find a solution. We are not looking to pay you a handout, but for a solution which we are willing to pay for."

My new-found strategy of "getting to no" just saved me thousands. Before, I would have spent hours trying to find a way to work with this company; however, by using this strategy, I spent less than an hour.

My Favorite Ways to Ask the Tough Questions

1. Ask for money–even just a little bit. If I'm in talks with a client for any period of time, and start to provide any value to them as a consultant, I write a proposal and ask for a small retainer. For many companies, getting a new vendor into a procurement system is time consuming. If they're not willing to do that, it's a good indication that it's time to move on.

2. In a phone conversation, ask your client, "If you were sitting where I am, would you be pursuing this opportunity? Do you think your firm is going to hire us for this project?"

3. Learn to be professionally direct. "Are there funds set aside for our proposal?"

4. Learn not to view rejection personally. "Do you have the authority to issue a purchase order for our work or is there someone else that should be involved in the process?"

5. Be open to criticism. "Is there something I should be doing differently on my end? I feel like we both agree that our services are of value, but I don't get a sense that we're moving forward to working together."

6. Be creative. You have developed personal relationships with your clients. Find a way to professionally get the information you need. "Dave, what is the likelihood of your company issuing a PO for this work within the next six months?"

7. Practice. The more you start asking the difficult questions, the better you'll get at it.

A "no" is as good as a "yes," only in terms that it is definitive and allows you to make a decision and move on accordingly. Furthermore, it takes the control away from your client (all of whom are well-meaning) and puts it back into your hands, where it belongs.

I've found that better than 99% of all of my clients are sincere, kind, and thoughtful. I enjoy chatting with almost all of them. And herein lies the rub. Once you develop a personal relationship with someone, it's fundamental human nature that they don't want to disappoint you. I believe sometimes they simply don't have the heart to say no. So you must learn to be direct and ask.

How Do You Know When It's Time To Move On?

1. Keep track of your time and set a limit on how many hours you're willing to spend chasing an account. For example, you may limit your time to five hours a month on one account and then one hour every six months. If you're a contractor, you may want to use another matrix. It's not uncommon for clients not to return phone calls right away. However, if you've left five or 10 messages or emails then that might be useful as a measurement criterion. Either way, you must develop some type of system to ensure you're not chasing ghosts.

2. Don't be seduced by the size of the company or the size of the opportunity. This is particularly true if you're new, struggling, and/or in panic mode.

3. Trust your instincts. If you're getting the sense that you're wasting your time, you probably are. Learn to recognize the situation for what it is, not what you would like it to be.

4. Seek advice. Rejection is often a difficult thing to digest. Find business associates whom you trust, are economically successful, and willing to tell you like it is. Describe the situation to a couple of them, get a consensus, and implement their advice.

Cautionary Notes

1. Don't burn bridges. Always be polite, professional and kind.

2. Don't be afraid to find a different contact. The first one might be the wrong one, but don't give up on the account because of it.

JPCL

About the Author

Warren Brand has been involved in the coatings industry for more than 25 years. He earned his master's degree in business while working in his family's coating application business. In that time, he also earned his SSPC Protective Coatings Specialist certification and is a NACE Level 3 Certified Coating Inspector. He successfully guided his former business through challenging regulations affecting underground storage tanks. He has started several successful divisions and new businesses, including Chicago Coatings Group, LLC, and most recently, W Brand Consulting, LLC.

Graco Upgrades Polyurea/Foam Sprayer

Software and hardware advances to improve application accuracy and data tracking lead the list of upgrades to Graco Inc.'s new Reactor 2.

The plural-component sprayer for polyurethane foam and polyurea now features innovative data reporting technologies to help owners track and record jobsite activity and spraying parameters, the company says.

The first Reactor product was released 10 years ago, and the latest model was developed in response to customer feedback, according to Tryg Waterhouse, product marketing manager, Graco Applied Fluid Technologies Division.

Photo courtesy of Graco

According to Graco, these customer-driven changes include:

- a 40% smaller footprint than a standard Graco Reactor for more room in the spray rig;
- the relocation of electronics for easier service; and
- an advanced motor control module and software that produces a smoother, more consistent spray performance.

The advanced display module features data download, chemical recipe storage, drum level indicators, and on-screen troubleshooting, Graco notes.

The Reactor 2 Elite model comes with an inlet pressure and temperature sensor; Xtreme-Wrap Scuff Guard on heated hoses for Reactor 2 packages; and Graco InSite, a remote reporting technology that enables owners of spray-foam businesses to see real-time jobsite data via smart phone, tablet, or computer.

The product comes in electric stand-alone models and integrated systems.

New Elcometer Gauges Work with Mobile Devices

New inspection gauges from Elcometer transfer data directly to mobile devices to produce instant inspection reports, the company announced.

The Elcometer 456 coating thickness gauge and Elcometer 224 surface profile gauge have Bluetooth connectivity for iPhone, iPad, and Android mobile devices.

Photo courtesy of Elcometer

Data from the inspection gauges can be transferred directly to mobile devices running the ElcoMaster Mobile app. The free software from Elcometer allows users to transfer data and produce inspection reports instantly without having to use a computer, according to the company.

Features of the mobile app include the ability to:

- transfer inspection batches to generate PDF reports;
- store live readings on mobile devices, along with the measurement's GPS coordinates to plot them on a map;
- add reading limits, photographs, general notes and comments to inspection data; and
- email a PDF report.

By using Bluetooth, multiple gauges can be connected at the same time without having to disconnect other devices, according to Elcometer.

These stories and others like them can be found at *PaintSquare News*, a daily electronic newsletter. To subscribe, go to paintsquare.com/subscribe.

Hempel's New Coating Has Tie-Coat Properties

Hempel USA has introduced an anti-corrosive coating and primer with antifouling tie-coat properties for atmospheric and immersion service.

Hempadur 47183 is a high-solids, low-VOC, modified polyamide adduct-cured epoxy.

According to the company, the coating can be used as a tie-coat between epoxy and physically drying coatings in atmospheric and immersion service applications.

For immersion service, Hempadur 47183 can replace one anti-corrosive primer coat in an underwater coating system and simultaneously act as a tie-coat for antifouling, the company says. It can also be used as a sealer for old antifouling coatings.

According to Hempel, the coating was made to meet tighter VOC limits and to replace one primer coat for underwater hull specifications without compromising the anti-corrosive properties of the coating system.

Hemapdur 47183 features:

- 35% higher volume solids than Hempadur 45182;
- higher DFT build-up in a single coat application;
- extended recoat interval; and
- improved anti-corrosive properties.

Belzona Coating Protects Immersion Equipment

A new epoxy coating from Belzona offers high-temperature protection for oil and gas production equipment and other equipment operating under continuous immersion, the company announced.

Belzona 1523 is a two-part spray-applied epoxy coating for equipment in continuous water and hydrocarbon mixture immersion at temperatures up to 140 C (284 F). The company says the coating can also withstand steam-out processes up to 210 C (410 F) and rapid depressurization.

According to the company, the coating provides corrosion and chemical resistance and comes in light colors for easy inspection in dark vessels. Applied using heated airless spray equipment, the two-coat application doesn't require flash blasting between coatings, Belzona says. The solvent-free product can be applied in confined spaces and cures at room temperature. No separate post-cure is needed because the product's post-cure mechanism activates at service temperatures, according to the company.

JPCL

FREE WEBINAR ON PERFORMANCE OF COATINGS OVER WATERJETTED SURFACES

This webinar will explore issues associated with waterjetting prior to application of protective coatings. The latest SSPC waterjetting standards (WJ-1, WJ-2, WJ-3 and WJ-4) will be described along with information about their use in project specifications. The webinar will conclude with a brief review of technical literature relating to the performance of coatings applied over waterjetted steel surfaces.

September 3, 2014
11:00 a.m.-Noon, EST

Register at
paintsquare.com/education

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WEBINAR EDUCATION SERIES

31st International Bridge Conference Returns to Pittsburgh

From June 8–12, the Engineers' Society of Western Pennsylvania (ESWP) will sponsor the 31st annual International Bridge Conference (IBC) at the David L. Lawrence Convention Center in Pittsburgh, Pa.

The IBC draws over 1,500 attendees annually, including bridge owners, engineers, and designers, senior policy makers, government officials, construction executives, and manufacturers and suppliers from throughout the U.S. and abroad. The conference will be made up of technical sessions, workshops, special interest sessions, seminars, committee meetings, an awards ceremony, and an exhibit hall that will feature more than 125 exhibitors.

The following is a list of presentations and workshops held throughout the technical program that may be of interest to protective coatings professionals. For more information, visit eswp.com/bridge.

Wednesday, June 11

- "Restoration of the Corning Centerway Bridge" (IBC 14-71), presented by Joseph Logan, P.E., and Emily Smith, P.E.; Fisher Associates, P.E., L.S., L.A., P.C.; 8:30 a.m.–12:00 noon. This paper will discuss the in-depth inspection and evaluation of a historic concrete arch bridge, including nondestructive concrete testing techniques and restoring surfaces subjected to alkali-silica reaction.
- "Rehabilitation of I-794 and Hoan Bridge" (IBC 14-73), presented by Robert W. Bondi, P.E., Michael Baker Jr., Inc.; and Carolyn Gelling, P.E., WISDOT; 8:30 a.m.–12:00 noon. This paper will focus on the rehabilitation design and construction schedule—including painting—for an elevated bridge in Milwaukee, Wis., and will discuss effective strategies for project delivery.
- "Duplex Coatings for Bridge Preservation" (W-03), presented by AZZ Galvanizing

Exhibitors at IBC

The following is a list of exhibitors at IBC (with corresponding booth numbers) that may be of interest to bridge and highway protective coatings professionals, current as of press time. A complete list of exhibitors is available on the IBC website.

AP/M Permaform 201
AZZ Galvanizing Services.....312
Epoxy Interest Group of CRSI ...216
Euclid Chemical Compnay 529
Evonik Industries.....225
Greenman-Pedersen, Inc. 428
HalenHardy 636
HRV Conformance Verification Associates, Inc. 610
Klass Coatings (North America) LLC.....300
Safway Services 631/633/730/732
Sika Corporation 500
Spider.....712
Stronghold Coating Systems 532
Termarust.....313
Vector Corrosion Technologies 403

David L. Lawrence Convention Center. Photo courtesy of VisitPittsburgh

Services; Wednesday, June 11, 1:00–4:00 p.m. This workshop will assess the effectiveness of a new coatings system applied over hot dipped galvanized steel bridge members.

Thursday, June 12

- "MASHH—Mobile Air Shower by HalenHardy, Protecting Workers from Silica and Lead Dust" (W-06), presented by HalenHardy, LLC; 8:00–9:00 a.m. This workshop will highlight new technology that helps keeps workers safe from dangerous dust and debris generated through blasting operations.
- "Delivering the 100-Year Bridge" (W-08),

Boston Convention & Exhibition Center. Photo courtesy of Massachusetts Convention Center Authority

presented by Michael Baker Jr., Inc.; 1:00–3:00 p.m. Design-build methods for achieving a 100-year service life bridge, as well as ways to protect and extend the service life of a concrete bridge deck, will be discussed in this workshop.

AWWA Brings ACE14 to Boston

The American Water Works Association (AWWA) will host ACE14, its annual conference and exposition, from June 8–12 at the Boston Convention & Exhibition Center in Boston, Mass.

ACE14 will include workshops, professional program tracks, keynote and speeches from industry experts, forums, networking opportunities, facility tours, special events, and more. The following is a list of programs that may be of interest to industrial and marine coatings professionals. For more information, visit awwa.org.

Sunday, June 8

• Workshop: "Getting a Grip on External Corrosion for Infrastructure Stability" (SUN02), moderated by Mike Horton, U.S. Pipe and Foundry Company—Tech Services; 9:00 a.m.–4:00 p.m. This workshop will explain the basics of corrosion and will highlight some of the best methods for corrosion prevention and control. Sessions of interest include:

– "Importance of Controlling External Corrosion," presented by Graham Bell, HDR Schiff; 9:05 a.m.
– "Chemistry of Corrosion," presented by Jeffrey Schramuk, CP Solutions, Inc.; 9:30 a.m.
– "Evaluating the Potential for Corrosion," presented by Mike Horton, U.S. Pipe & Foundry Company—Tech Services, and Jeff Slaughter; 11:00 a.m.
– "Corrosion Control and Protection of Buried Pipelines," presented by David Kroon, Corrpro/Aegion, L. Gregg Horn, Sylvia Hall, and Jeffrey Schramuk; 1:30 p.m.
– "Atmospheric Corrosion," presented by Brad Finley, Alabama Specialty Products, Inc.; 3:00 p.m.
–"Corrosion Control of Water Storage Tanks," presented by Graham Bell, HDR Schiff; 3:30 p.m.

• Workshop: "Learn How Water Main Rehabilitation Technologies Can Help Solve Your Infrastructure Challenges: Materials Education, Utility Lessons Learned, and

Interactive Technology Demonstrations" (SUN03), moderated by Andrew Whelton, University of Southern Alabama; 9:00 a.m.–4:00 p.m. This workshop will help attendees in selecting, overseeing, and using coatings and polymer pipe for water main rehabilitation. Sessions of interest include:

– "Polymers for Water Infrastructure Repair," presented by Andrew Whelton, Univ. of South Alabama; 9:05 a.m.

– "Lessons Learned #1: Firsthand Experience with Water Main Polyurethane, CIPP, and CML," presented by John Gillespie and Michael Wolan, New Jersey American Water, and David Hughes; 10:30 a.m.

– "Live Demo and Education of Polyurethane and Epoxy Lining," presented by Leonard Assard, Heitkamp Inc.; 2:00 p.m.

Tuesday, June 10

• "Water Main Rehabilitation: Planning, Prioritization and Processes" (TUE19), moderated by Jon Turner, 9:00 a.m.–12:00 noon. This session will focus tools for selecting water mains for rehabilitation as well as determining the best process for the specific situation. Presentations of interest include:

– "Interactive Lining : A Main Rehabilitation Solution That Is set to Become a Key Element of Cost-Effective Asset Management," presented by Thomas Sangster, Downley Consultants, and Holger Turloff; 10:30 a.m.

– "Cements, Polys, and Resins, Oh My! A Water Utility's Journey Evaluating and Implementing Different Main Rehabilitation Options," presented by Michael Wolan, New Jersey American Water, John Gillespie, and David Hughes; 11:00 a.m.

• "Advancements in Water Quality and Distribution System Modeling" (TUE38), moderated by Steve Price; 1:30–4:30 p.m. This session will discuss issues that utility companies may face when maintaining and operating a distribution system. This session includes:

– "Evaluation Of Water Service Line Lining and Coating Technologies," presented by Stephen Randtke, University of Kansas–CEAE Dept., Rachael Lane, Zachary Breault, Craig Adams, Edward Peltier, Ray Carter, and J. Alan Roberson; 2:30 p.m.

Exhibitors at ACE14

The following is a list of exhibitors at ACE14 (with corresponding booth numbers) that may be of interest to protective and marine coatings professionals, current as of press time. A complete list of exhibitors can be found on the ACE14 website.

3M 752
Ameron International.....901
Caldwell Tanks, Inc.....1147
CB&I 2504
Corrpro Companies, Inc. 1521
Denso 1864
Farwest Corrosion Control 1547
Fisher Tank Company.....1525
Induron Coatings Inc. 1149
Insituform Technologies, LLC 1521
International Paint/Devoe Coatings 718
ITW Polymers Coatings North America.....2470
NACE International 950
Pittsburg Tank & Tower Maintenance Co., Inc. 1040
Plascoat.....2549
PPG Protective & Marine Coatings 1953
Raven Lining Systems 1446
SEH, Inc.....2574
Sherwin-Williams.....2533
Tank Industry Consultants.....2324
Tnemec Company, Inc. 1924
Trenton Corporation 2437
VersaFlex Inc. 964

Wednesday, June 11

• Poster Session: "Water Resources, Potable Reuse, and Conservation Posters" (PST04); 8:15–10:45 a.m. This poster session givens attendees the opportunity to speak one-on-one with presenters about how to protect water supplies, conservation strategies, and tactics for developing alternative water sources. This session includes:

– "Energy Savings Through Pump Refurbishment and Coating," presented by Paul Maier, Monroe County Water Authority, Richard Metzger, Randy White, and Christian King; 8:15 a.m.

McMillin Event Center at the NTC at Liberty Station. Photo courtesy of the NTC Foundation.

San Diego Welcomes Mega Rust 2014

From June 24–26, The American Society of Naval Engineers (ASNE) will host Mega Rust 2014: Naval Corrosion Conference, at the Naval Training Center (NTC) at Liberty Station in San Diego, Calif.

Mega Rust 2014 will bring together various representatives from government, military, ship owners and operators, shipyards, research facilities, and coatings suppliers to examine the latest innovations in corrosion control and coatings technologies for naval and maritime ships, craft, and aviation systems. The conference consists of technical programs, technical papers, an exhibition, and accreditation courses from SSPC and NACE International.

For more information, visit navalengineers.org/megarust2014.

SSPC Courses at Mega Rust 2014

The following SSPC training courses will be offered at Mega Rust 2014.

• NAVSEA Basic Paint Inspector (NBPI), June 23–27

• Navigating NAVSEA Standard Item 009-32, June 24

- Using SSPC PA 2 Effectively, June 25
- Quality Control Inspector (QCS), June 26–27

To register, visit the Mega Rust website.

Exhibitors

The following is a list of exhibitors and booth numbers at Mega Rust 2014, current as of press time. A complete exhibitors list is available at the Mega Rust website.

3M Defense 215
Av-DEC.....119
A.W. Chesterton 108
Belzona, Inc.....114
Desco Manufacturing Co., Inc. 216
Dex-O-Tex Marine by Crossfield Products Corp.....219
DRYCO 220
Elcometer.....112
Fischer Technology, Inc.....212
Honeywell Safety Products.....103
Honsa Ergonomic Technologies, Inc.....120
Hydrex, LLC.....122
International Marine & Industrial Applicators, LLC.....214
International Paint LLC.....210
ITW Polymer Coatings N.A. 205
J Chadwick Co.....209
Monti Tools 204
Munters Corporation 116
NACE International.....TBD
NCP Coatings, Inc. 217
Oshkosh Finishing Services.....207
Parker Ionics.....206
Polygon US Corporation.....222
PPG Protective & Marine Coatings.....121
QuaLED Lighting.....208
Sherwin-Williams 110
Silva Non Skid Solutions, LLC ..117
SSPC: The Society for Protective Coatings.....TBD
Sulzer Mixpac USA, Inc.....100
Sunbelt Rentals, Inc. 115
TFT-Pneumatic, LLC 105
Western Technology, Inc.....202

Upcoming *JPCL* Show Previews

WEFTEC 2014: The Water Quality Event
(Water Environment Federation)
Sept. 27–Oct. 1, New Orleans, La., weftec.org

2014 WJTA-IMCA Expo
(WaterJet Technology Association and Industrial & Municipal Cleaning Association)
Oct. 13–15, New Orleans, La., wjta.org

International WorkBoat Show & Annual Conference
Dec. 3–5, New Orleans, La., workboatshow.com

World of Concrete 2015
Feb. 2–6, Las Vegas, Nev., worldofconcrete.com

SSPC 2015 featuring GreenCOAT
Feb. 3–6, Las Vegas, Nev., sspc2015.org

SSPC Organizational Members as of April 18, 2014

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Binks Devilbiss Ransburg BGK
Carboline Company
Corrpro Companies Inc.
Greenman-Pedersen Inc.
ITW Polymers Coatings North America
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Bollinger Shipyard
Central AZ Water Conservation Dist.
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Cives Steel Company, Midwest Division
Colonna's Shipyard Inc.
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Energy Northwest
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Hyundai Samho Heavy Industries Co., Ltd.
Illinois Dept. of Transportation
Indiana Dept. of Transportation
Kentucky Transportation Cabinet
Louisiana Dept. of Transportation & Development
Luminant
Lyon Shipyard Inc.
Maine Dept. of Transportation
Marisco Ltd.
Maryland State Highway Administration
Ministry of Transportation Bridge Office
Minnesota Dept. of Transportation
MODOT Maintenance Operations
Monroe County Water Authority
NASA-Kennedy Space Center
National Steel & Shipbuilding Co.
Naval Facilities Engineering Service Center
NAVSEA
Nebraska Public Power District
Norfolk Naval Shipyard Production Dept.
North Carolina DOT
North Florida Shipyards Inc. Mayport Naval Station
NYC School Construction Authority
Ohio Dept. of Transportation Central Office
Oklahoma Dept. of Transportation
Ontario County DPW
Oro Loma Sanitary District
Pacific Gas & Electric Company
Pacific Ship Repair & Fabrication Inc.
Pacific Shipyards International
Pearl Harbor Naval Shipyard & IMF
Pennsylvania Dept. Of Transportation, Materials & Testing
Piedmont Natural Gas
Portsmouth Naval Shipyard Code 250
Puget Sound Naval Shipyard II
River Steel Inc.
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SURFMEPP
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Textron Marine & Land Systems
US Navy-SUBMEPP
Vigor Industrial LLC
Vigor Shipyards
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West Virginia DOT, Division of Highways

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American Institute of Steel Construction (AISC)
PRA Coatings Technology Centre

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Cornerstone Painting Contractors Inc.
Dalco Services Inc.
Demilec USA
Dex-O-Tex division Crossfield Products Corp.
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Dow Chemical Company
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Genesis Environmental Solutions Inc.
Graydaze Contracting Inc.
Harrybeat International Services Limited
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Hempel USA Inc.
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International Marine and Industrial Applicators LLC
ITPTS Technical Institute of Preparation and Surface Treatment
Jotun Paints Inc.
Kelly-Moore Paint Company Inc.
Kinyon Construction Inc.
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Magnum Energy Services Ltd.
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Mid-Atlantic Coatings Inc.
Mobley Industrial Services Inc.
Mohawk Northeast Inc.
Naval Coating Inc.
North American Coatings, CL Coatings Division
North Star Painting Co. Inc.

Northwest Sandblasting & Painting Inc.
NTS Inc.
Odyssey Contracting Corporation
Olympic Enterprises Inc.
Ostrom Painting & Sandblasting Inc.
Polygon
Precon Marine Inc.
Pro Tank—Professional Tank Cleaning & Sandblasting
Puget Sound Coatings Inc.
Quality Coatings of Virginia Inc.
Redwood Painting Company Inc.
Rust-Oleum Corporation
Shinko Company Ltd.
Sil Industrial Minerals, Inc
South Bay Sand Blasting & Tank Cleaning
StonCor Group Canada, Carboline/Plasite Coatings Group
Sturgeon Services International
Surface Technologies Corporation
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Tank Industry Consultants Inc.
Termarust Technologies
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TSC Training Academy
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Ability With Innovation LLC (AWI)
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ABS—American Bureau of Shipping
Abu Dhabi Construction Company LLC
ACME Industrial Piping
Adelphi Inc., dba G-Force Contracting
Advance Industrial Coatings, LLC
Advanced Industrial Services Inc.
Advanced Painting Systems Inc.
Advanced Polymer Coatings Ltd.
Advanced Recycling Systems Inc.
Advantage Steel and Construction LLC
Aetna Bridge Company
Ahern Painting Contractors Inc.
AIR Systems International
Akzo Nobel International Paint (SUZHOU) Co., Ltd.
Al-Jazeera Paints Academy
Alabama Painting Inc.
Alaron Nuclear Services
All Painting Contractors Inc
All-Safe Industrial Services Inc.
All-Set Corp.
All-Star Cleaning & Preservation
All-States Painting Inc.
Allan Briteway Electrical Contractors Inc.
Allied Painting Inc.
Allnex USA Inc.
AlpAccess
Alpha Painting and Construction Company Inc.
ALS Industrial Services
American Industrial Hygiene Assoc.
American Suncraft Construction
American Tank & Vessel Inc.
Americlean
Ameritec Industrial & Commercial Coatings
Amherst Maintenance Inc.
Amstar of Western New York
Anchor Paint Mfg. Co.
Anka Painting Company Inc.
Anticorrosivos y Acabados AYA
APBN Inc.
Applewood Painting Co.
Applied Coatings & Linings
Applied Corrosion Technology Co. LLC
Arena Painting Contractors Inc. (APC)
Arid Dry by CDIMS
Arizona Coating Applicators Inc.
Armour Painting & Cleaning Services Inc.
Arrow Construction Company Inc.
Astron General Contracting Co. Inc.
Atlantic Design Inc.
Atlantic Painting Co. Inc.
Atlas Painting & Sheeting Corp.
Atlas Steel Coatings Inc.
Automatic Coating Ltd.
Axxiom Manufacturing Inc
B&B Corporation
Banchang Protective Coating Limited Partnership
Banjobphan Engineering Co. Ltd.
Barnes Painting
Barton International
BASF Corporation
Basic Industries, Ltd.
Bass Rocks Construction Corporation
Bayer MaterialScience Trading (Shanghai) Co., Ltd
Baytown Painting Inc.
Bazan Painting Company
Belzona Polymerics Limited
Bilton Welding & Manufacturing Ltd.
BIS Salamis Inc.
Black Bear Coatings & Concrete
Blastal Coatings Services Inc.
Blastech Enterprises Inc.
Blasting Experts Ltd.
Blastline Institute (BISP)
Blastrite Pty. Ltd.
Blendex Industrial Corporation
BMP Sandblasting & Painting
Boville Industrial Coatings Inc.
Bridges R Us Painting Co. Inc.
Bryant Industrial Services LLC
Buckman Laboratories Inc.
Bullard Co.
BYK Additives & Instruments
C & K Johnson Industries Inc.
C.E. Adkins & Son Inc.
C.W. Beal Inc.
Cabrillo Enterprises Inc., dba-R.W. Little Company
Cactus Coatings Ltd.
Caldwell Tanks Inc.
California Engineering Contractors Inc.
Caligari Gerloff Painting Inc.
Camabo Industries Inc.
CanAm Minerals/Kleen Blast Abrasives
Cape Environmental Management Inc.
Capitol Finishes Inc.
Cardolite Corporation
Carneys Point Metal Processing Inc.
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Carr's Ind. Blasting & Coating LLC
Catamount Environmental Inc.
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CDV Industrial EIRL
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County Group Companies
Crescent Coatings & Services Inc.
Crown Painting Inc.
CSI Services Inc.
Culbertson Contractors
Custom Engineering Co.
Cypress Bayou Industrial Painting Inc.
D.H. Charles Engineering Inc.
DACA LLC
Dalian YuXiang
Dampney Company Inc.
Darran Green Sandblasting & Painting
Daubert Chemical Company
Davis Boat Works Inc.
Dawson-Macdonald Company Inc.
DeFelsko Corporation
Dehumidification Technologies LP
Delta Coatings Inc.
Demaco Corporation
Demos Painting & Decorating Inc.
Denso North America Inc.
Derochie Painting Ltd.
Derrick Company Inc.
DESCO Manufacturing Company Inc.
Detroit Painting & Maintenance Inc.
Detroit Tarpaulin Inc.
Devco Sandblasting & Industrial Coating Inc.
Devox S.A.
Diamond Vogel Paint Company
Distribuidora Kroma S.A. de C.V.
Diversified Container
Diversified Project Services International Inc. (DPSI)
Dixon Engineering Inc.
DMA Floors
Doosan Portable Power
DRS Environmental Systems
DRYCO, LLC
Dubai Coating Limited
Dumond Chemicals
Dun-Right Services
Dunlap Industrial Coatings
Dur-A-Flex Inc.
Dura-Bond Pipe, LLC
E. B. Miller Contracting Inc.
E. Caligari & Son Inc.
E.J. Chris Contracting Inc.
Eagle Painting & Maintenance Co.
Eagle Specialty Coatings
Earl Industries, LLC
EASE Painting and Construction
East Coast Painting & Maintenance, LLC
Eco CorFlex
EDCO-Equipment Development Co. Inc.
EDECO Peru S.A.C
Elcometer
Elektro-Physik USA Inc.
Elite Contractors Inc.
EMI International LLC
EMW Industrial
EnDiSys
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Continued

SSPC Organizational Members

Environmental Planning & Management
EPAcoat Inc.
EPMAR Corporation
Era Valdivia Contractors Inc.
Erie Painting and Maintenance Inc.
Ervin Industries
Euro Paint LLC
Euro Style Management Inc.
Examinetics Inc.
Excalibar Minerals LLC
Excel Engineering & Contracting Co.
Extreme Coatings Inc.
F.T. Farfan Limited
F.T.I. District Council 57 J.A.T.F.
Farr Construction Corporation
Farwest Corrosion Control Company
FCS Group LLC
Fedco Paints And Contracts
Fine Painting And Allied Services, LLC
Finishing Plus
Finishing Systems of Florida Inc.
Fischer Technology Inc.
Forecast Sales
Frey Coating Solutions Inc.
Front-Line Coatings LLC
FTI of DC 77
Fuel Tank Maintenance
G & M Painting Enterprises Inc.
G & S Manufacturing LLC
Gaditana de Chorro Y Limpieza, S.L.
GapVax Inc.
Garden State Council Inc.
Gartner Coatings Inc.
Gateway Industrial Services
Gemstone, LLC
General Coatings Corporation
General Dynamics NASSCO-Earl Industries (fma United Coatings Corp.)
General Dynamics/Information Tech.
General Industries
General Insulation Inc.
Geoblaster Equipment
George G. Sharp Inc.
Georgia-Pacific Chemicals LLC
Gill Industries Inc.
Glavin Coating & Refinishing Ltd.
GMA Garnet (USA) Corp.
Golden Triangle Industries Inc., dba Pro-Cure
Goodman Decorating Co. Inc.
Goodwest Linings and Coatings
GPI Southeast Inc.
GPPC Inc.
Grace Distributing Inc.
Gracie Painting LLC
Graco Inc.
Green Diamond Sand Products
Greener Blast Technologies
Groome Industrial Service Group
Growell Blastec Co., Ltd.
GS Engineering & Construction Corp.
Gulf Coast Contracting, LLC
Gunderson Inc.
Guzzler Manufacturing Inc.
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Hadek Protective Systems Inc.
Hadley Brothers Painting Inc.
Hall Industrial Contracting, Ltd.
Hancock Sandblast & Paint LLC
Hanson Pressure Pipe
Haraco Services Pte. Ltd.
Harrison Muir Inc.
Hartman-Walsh Painting Company
HCI Chemtec Inc.
HCI Industrial & Marine Coatings Inc.
HDR-Schiff Associates
Hempel-HaiHong
Henkels & McCoy
Hercules Painting Company
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High Steel Structures Inc.
Highland International Inc.
HippWrap Containment
HoldTight Solutions Inc.
Hong Hua Guan Marine & Engrg. Pte Ltd.
Honolulu Painting Company, Ltd.
Howell & Howell Contractors Inc.
HRV Conformance Verification Associates Inc.
Hunnicutt's Inc.
Huntsman Polyurethanes
Hurricane Construction, Ltd.
IBIX North America
IDS Blast Finishing
IMETECO S.A.
Impresa Donelli, S.R.L.
In-Spec Corporation Pte. Ltd.
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Industrial Vacuum Equipment Corp.
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Integrated Structural Concepts
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International Rigging Group LLC
Intertek Industry Services
IPAC Services Corporation
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ISG dba Universal Inc.
IUPAT, District Council #5
J. Goodison Company Inc.
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K.V.K. Contracting Inc.
Kane Inc.
Keene Coatings Corp.
Kennametal Inc.
Kern Steel Fabrication Inc.
Kimery Painting Inc.
Kiska Construction Inc. (KCI)
Klicos Painting Company Inc.
KMX Painting Inc.
KNK Painting & Coating Inc.
Knowles Industrial Service Corp.
L & L Painting Company Inc.
L. Calvin Jones
L. F. Clavin & Company Inc.
L.M. Temperature Control Inc.
Lambton Metal Service
Larson Electronics LLC
LBI Inc.
Ledcor Coating & Insulation Ltd.
Leighton Associates Inc.
Liberty Maintenance Inc.
Limnes Corp.
Lindner Painting Inc.
Line-X Corp.
Linita Design and Mfg. Co. Inc.
Llamas Coatings
LLC "UkrMistAntykor"
LorRich Enterprise, Ltd.
Luckinbill Inc.
Luoyang Hong Feng Refractories and Abrasives Co. Ltd.
M & D Coatings Inc.
M & J Construction Company
M & R Painting Inc.
M Shiroma Painting Company Inc.
M. Painting Company Inc.
M. Pallonji & Company Pvt. Ltd.
MacDonald Applicators Ltd.
Madison Chemical Industries Inc.
Madison Coating Company Inc.
Maguire Iron Inc.
Main Industries Inc.
Mandros Painting Inc.
Manolis Painting Company Inc.
Mansfield Industrial
Manus Abrasive Systems Inc.
Marcom Services, LLC
Marine & Industrial Coatings LLC
Marine Specialty Painting
Marine Steel Painting Corporation
Marinette Marine Corporation
Marinis Bros. Inc.
Mascoat Products
Mason Painting Inc.
Matheson Painting
Matsos Contracting Corp.
Maxlife Coatings
MB Environmental Consulting
McCormick Industrial Abatement
McCormick Painting Company
McElligott Partners Pty. Ltd.
McKay Lodge Conservation Laboratory
MCSA (Mantenimiento & Construcciones,S.A)
METCO Materials Evaluation & Tech. Corp.
Michelman-Cancelliere Iron Works
Midsun Specialty Products Inc.
MIK Industrial LLC
Miller Precision Manufacturing and Integration
Milspray LLC
Minerals Research & Recovery Inc.
MMLJ Inc.
Mobile Pipe Lining and Coating Inc.
Modern Protective Coatings Inc.
Mohawk Garnet Inc.
Monarflex by Siplast
Monoko LLC
MONTI Tools Inc.
Montipower Inc.
MST Inc. (Modern Safety Techniques)
Municipal Tank Coatings
Murphy Industrial Coatings
N A Logan Inc.
N G Painting, LP
N. I. Spanos Painting Inc.
NACE International—The Corrosion Society
National Coating and Linings Co.
National Coatings Inc.
Natrium Products Inc.
Negocios Metalurgicos SAC
Nelson Industrial Services Inc.
New England Sandblasting and Painting
NexTec Inc.
Niagara Coatings Services Inc.
Nisku Industrial Coatings Ltd.
NM Caribbean Insulation Services Ltd.
NOR-LAG Coatings Ltd.
Norfolk Coating Services, LLC
North West Tank Lining & Inspection Inc.
Northwest Sandblast & Paint LLC
Norton Sandblasting Equipment
Novatek Corporation
NUCO Painting Corporation
Nuplex Resins LLC.
NuSteel Fabricators Inc.
O.T. Neighoff & Sons Inc.
Odle Inc.
Oil States Industries (Asia) Pte. Ltd.
Oilgon Solutions Sdn Bhd
Olimag Sand Inc.
Olympus & Associates Inc.
Olympus Painting Contractors Inc.
Ontario Painting Contractors Association
OPT CO
Opta Minerals Inc.
Optimiza Protective & Consulting SL
Oregon Iron Works Inc.
Orfanos Contractors Inc.
P & S Painting Co. Inc.
P & W Painting Contractors Inc.
P S Bruckel Inc.
P&P Contracting, Inc.
P.C.I. International Inc.
Pacific Dust Collectors and Equipment
Pacific Painting Co Inc.
Pacific Titan Inc.
Pacific Yacht Refitters Inc.
Paige Decking
Paige Floor Covering Specialists
Paint Inspection Ltd.
Painters USA Inc.
Panco Resources and Engineering Consultancy Services

Panther Industrial Painting, LLC
Paragon Construction Services of America Inc.
Park Derochie (Seaside) Coatings Inc.
Park Derochie Inc.
Paso Robles Tank Inc.
Paul N. Gardner Company Inc.
PCI Advanced Protective Coating
PCI Roads, LLC
Peabody & Associates Inc.
Pen Gulf Inc.
Performance Blasting & Coating
Petrochem Insulation Inc.
Phillips Industrial Services Corp.
Phoenix Fabricators & Erectors Inc.
Piasecki Steel Construction Corp
Pinnacle Central Company
Planet Inc.
Plasma Coatings
Plastic Powder Coating Company LLC
Poly Delta Coatings
Pop's Painting
Poseidon Construction
PPG Industries China
Precision Industrial Coatings Inc.
Preferred Inc.–Fort Wayne
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Pro-Spec Painting Inc.
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Prospectrum Coatings bvba
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QED Systems Inc.
Qindao Advanced Marine Material Technology Ltd.
Quality Assured Industrial Coatings
Quality Linings & Painting Inc.
Quantum Technical Services
Quincy Industrial Painting Co.
Quindao Advanced Marine Material Technology Ltd.
Quinn Consulting Services Inc.
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Rainbow Inc.
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Raven Lining Systems
Razorback, LLC
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Samac Painting
San Diego Protective Coatings Inc.
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Sauereisen
Scott Derr Painting Company
Seal For Life Industries LLC
Sealteks Inc.
Seaway Painting LLC
Secondary Services Inc.
See Hup Seng Limited
Seifert Construction Inc.
Seminole Equipment Inc.
Service Contracting Inc.
Services Acquisition Co LLC, dba Tank Services
Servicios Tecnicos Industriales y Maritimos, S.A. (SETIMSA)
Seymour Midwest
Shanghai Congsheng Coating Equipment Co. Ltd.
Shanghai Liangshi Blasting & Coating Equipment Co. Ltd
Shanghai Zenhua Heavy Industry Group
Shenzhen Asianway Corrosion Protection Eng. Co., Ltd.
Sherwin-Williams Brasil
Sherwin-Williams Industrial & Marine Coating China
Shopwerks Inc
Sigma Enterprises LLC
Simpson Sandblasting and Special Coatings Inc.
Skinner Painting & Restoration
Skyline Steel LLC
SME Steel Contractors
Smith Construction Group
Soep Painting Corporation
Soil & Materials Engineers Inc.
Sonic Coating Solutions Inc.
Southern Paint & Waterproofing Co.
Southern Painting & Blasting, LLC
Southern Road & Bridge LLC
Southland Painting Corporation
Spartan Contracting, LLC
Specialty Application Services Inc.
Specialty Finishes, LLC
Specialty Groups Inc.
Specialty Polymer Coatings Inc.
Specialty Products Inc.
Spensieri Diversified LLC
Spider
Sponge-Jet Inc.
Sprayroq Inc.
SRI Construction LLC
SRT Sales and Service, LLC
Stantec
Steel Fabricators of Monroe, LLC
Steel Management System, LLC
Steel Painters Inc.
Steele Consulting Inc.
Stinger Bridge & Iron
Stork Technical Services
Structural Coatings Inc.
Sulzer Mixpac USA Inc.
Sunbelt Rentals
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Superior Painting Co. Inc.
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SVMB
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TIB Chemicals AG
Tidal Corrosion Services LLC
Tidewater Staffing Inc.
Timco Blasting & Coatings Inc.
Tioga Inc.
Titan Industrial Services
TJB Inspection & Construction Services Inc.
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Topline Limited
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U.S. Coatings
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United Decorating Inc.
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VersaFlex Incorporated
Versatile Painting & Sandblasting
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Vimas Painting Co. Inc.
Vision Painting & Decorating Services
Vision Point Systems
VMP Research & Production Holding JSC
Vulcan Painters Inc.
W Abrasives
W Q Watters Company
W S Bunch Company
W W Enroughty & Son Inc.
Wagner Systems Inc.
Waskey Services, LLC
Wasser High-Tech Coatings Inc.
Waveland Services Inc.
Wenrich Painting Inc.
Western Industrial Services, Ltd.
Western Industrial Inc.
Western Technology Inc.
Wheelabrator
Wheelblast Inc.
Wilkinson Sandblasting, LLC
WIWA LP
Worldwide Industries Inc.
Worth Contracting
Wuhan Hengyitong Corrosion Engineering Co. Ltd
Wuxi Ding Long Trading Co. Ltd.
X'lam Leeo Technology Co Ltd
XI'AN Jing-Jian Paint & Coatings Group
Xinjiang Hongshan Coatings Co. Ltd.
Xtreme Polishing Systems
Yankee Fiber Control Inc.
Yejian New Material Co., Ltd.
Yellow Creek Coating Services
Yiwen USA
YungChi Paint & Varnish (Kunshan) Co Ltd.
YYK Enterprises Inc.
Zachry Industrial Inc.
Zebron Corporation
Ziegler Industries Inc.
ZRC Worldwide

Mayfield Dam.
Photos by Mick Klass, courtesy of Tacoma Power

Coatings Work at Two Wash. Dams Awarded

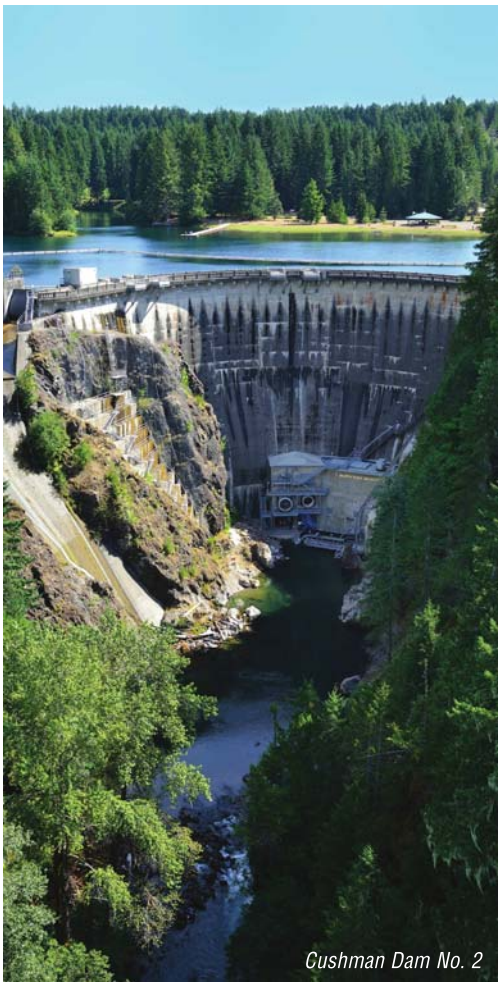
Certified Coatings Co. (Fairfield, Calif.), SSPC-QP 1- and -QP 2-certified, and the City of Tacoma, Washington, have agreed on a $2,496,888 contract to clean and recoat exterior surfaces of three penstocks and three vent stacks at Cushman Dam No. 2, as well as upstream and downstream faces of two spillwater gates at the Mayfield Dam.

Constructed in 1930 on the North Fork of the Skokomish River, the 575-foot-long, 235-foot-tall Cushman Dam No. 2 forms Lake Kokanee. Its three generators produce an average of 233 million kilowatt-hours of power annually, according to Tacoma Public Utilities (TPU). Steel surfaces to be painted at Cushman No. 2 include three 925-foot-tall penstocks and three 120-foot-tall vent stacks. The steel will be pressure washed, hand tool and power tool cleaned (SSPC-SP 2 and 3), and recoated with a moisture-cured urethane system.

The 850-foot-long, 250-foot-tall Mayfield Dam was built in 1963 on the Cowlitz River, forming Mayfield Lake. The power plant at the Mayfield Dam generates an average of 804 million kilowatt-hours annually, according to TPU. The two 45-foot-tall by 40-foot-wide spillway gates will be spot power tool cleaned to White Metal (SSPC-SP 11), abrasive blast cleaned to a Near White finish (SSPC-SP 10) on the upstream sides and a Commercial finish (SSPC-SP 6) on the downstream sides, and recoated with a moisture-cured urethane system. The use of dehumidification is required.

The existing coatings on all of the structures are lead-based and will require containment. The contract also includes an alternate option to clean and recoat three additional gates at the Mayfield Dam in 2015.

There were six total bidders on this contract, with a second-lowest bid of $2,700,300, and a high bid of $4,771,700.



Cushman Dam No. 2

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SSPC Courses

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June 2–3 ATT Train-the-Trainer, Pittsburgh, Pa.
June 2–7 BCI Levels 1/2, Newington, N.H.
June 2–7 PCI Levels 1/2, Rayong, Thailand
June 3–5 Plural Comp App, Santa Fe Springs, Calif.
June 4 Nav Std Item 009-32, Norfolk, Va.
June 5–6 C13 Water Jetting, Seattle, Wash.
June 6 CAS Refresher, Norfolk, Va.
June 7 CAS Level 1, Norfolk, Va.
June 7 PCI Level 3, Singapore
June 7–8 CAS Level 2, Norfolk, Va.
June 8 PCI Level 3, Rayong, Thailand
June 9–13 C2 Planning & Spec, Portland, Ore.
June 9–13 NBPI, Norfolk, Va.
June 12–13 C14 Marine Plural Comp Prgm, Seattle, Wash.
June 14 PCS Prot Ctgs Spclst, Portland, Ore.
June 16–21 PCI Level 2, Manila, Philippines
June 17 Estimating, Houston, Texas
June 18 Contact, Houston, Texas
June 19–20 Project Mgmnt, Houston, Texas
June 20 Nav Std Item 009-32, Seattle, Wash.
June 21–22 C12 Airless Spray, Chesapeake, Va.
June 23–27 C1 Fundamentals, Ventura, Calif.
June 23–27 NBPI, San Diego, Calif.*
June 24 Nav Std Item 009-32, San Diego, Calif.*
June 25 Using PA 2 Effectively, San Diego, Calif.*
June 26–27 QCS Qual Cntrl Spvr, San Diego, Calif.*
June 28–29 C7 Abrasive Blast, Norfolk, Va.
June 30–July 5 PCI Level 1/2, Kuantan, Malaysia

**Courses to be held at Mega Rust 2014*

Conferences and Meetings

June 1–5 ASCE 33rd PIANC World Congress, San Francisco, Calif., asce.org
June 8–11 ASSE Safety 2014, Orlando, Fla., asse.org
June 8–12 AWWA Annual Conf & Expo (ACE14), Boston, Mass., awwa.org
June 8–12 ESWP Int'l Bridge Conf (IBC), Pittsburgh, Pa., eswp.com
June 17–19 NACE Bring on the Heat 2014, Houston, Texas, nace.org
June 24–26 Mega Rust 2014 (ASNE), San Diego, Calif., navalengineers.org
June 24–27 A&WMA 2014 Conf/Expo, Long Beach, Calif. awma.org

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