NPCA and FSCT to Merge, Combine Shows

The National Paint & Coatings Association (NPCA) and the Federation of Societies for Coatings Technology (FSCT) have signed a Memorandum of Agreement that will merge the two organizations under a single governance structure, while preserving each group's identity.

The "governance merger" will consolidate the governance, management, and administrative functions of both groups under NPCA, while preserving each organization's operations, functions, and member services.

As part of the merger, FSCT and NPCA have agreed to combine the International Coatings Expo (ICE) with the American Coatings Show and Conference (ACS) to be held on June 2-5, 2008, in Charlotte, NC. ICE 2008 in Chicago will be canceled.

In addition, NPCA and FSCT will endorse and support the FSCT's international technology conference, *FutureCoat!*, which will continue as the signature science and technology event for the industry and a forum for the FSCT's Annual Meeting.

NPCA and FSCT have agreed to an action plan to finalize the merger. FSCT's Board of Directors has already approved the Memorandum of Agreement and has recommended approval to its membership; NPCA's Board of Directors will take formal action on the Agreement at its meeting on March 19.

Following a decision by NPCA's Board, the Agreement will be submitted to the FSCT general membership for approval beginning on March 21. Voting by the FSCT membership will likely take place between April 21 and May 2, 2008, for all members of record as of February 29, 2008. All aspects of the merger are expected to be completed by June 3, 2008.

International Paint Awarded 1st PSPC certificate

International Paint Ltd. (Felling, UK) has announced that the first Lloyd's Register IMO PSPC (Performance Standard for Protective Coatings) Type Approval Certificate has been awarded to Intershield® 300—an abrasion resistant, aluminium pure epoxy coating.

Michael Hindmarsh (right), Business Development Manager, International Paint, receives the Intershield 300 Type Approval Certificate from David Howarth, Global Technology Leader, Lloyds Register.

The PSPC is a new "Performance Standard for Protective Coatings" for Dedicated Seawater Ballast Tanks of all Types of Ships and Double-Side Skin Spaces of Bulk Carriers. Formally adopted at the Marine Safety Committee meeting (MSC 82) in Istanbul on December 8, 2006, the standard is applicable to newbuildings only and covers the protection of dedicated water ballast tanks. The standard will come into effect for all vessels over 500GT that are contracted on or after July 1, 2008, or if no contract, the keels of which are laid on or after January 1, 2009, or if delivery is on or after July 1, 2012.

To comply with the PSPC and the Type Approval Certification process, coatings must either pass stringent laboratory testing or be subjected to inspection and confirmation that the coating has provided a minimum of five years "good" in-service performance or that the coating has existing B1 Marintek approval. In addition, the coatings manufacturer must meet the approved supplier criteria for each supply location as set out in IACS UR Z17 and PR34.

The International Paint Technical Service Training Programme has also gained recognition from Lloyd's Register. Under the rules of the PSPC, all coating inspectors must either be qualified to NACE Coating Inspector Level 2, FROSIO Inspector Level III, or an equivalent qualification.

Muehlhan Appoints CEO of Subsidiaries

The Board of Muehlhan AG has announced the appointment of Tim LaBorde as the CEO of its subsidiary companies, Muehlhan Offshore Inc. and Meaux Surface Protection Inc. Mr. LaBorde will be responsible for all offshore operations for Muehlhan in the U.S., Mexico, and South America and for helping develop Muehlhan's global offshore strategy and marketing plans.

Mr. LaBorde, a certified NACE Coating Inspector, was previously employed in senior management and marketing positions by regional and multinational organizations within the corrosion control industry.

Muehlhan Offshore Inc. and Meaux Surface Protection Inc. recently moved into their new state-of-the-art facility in Scott, LA. The new facility will serve as headquarters for all Muehlhan global offshore operations and will also be used as a training center for the entire Muehlhan Group in the U.S. Muehlhan AG, a publicly traded company (Hamburg Stock Exchange) is an international specialist in surface protection. Muehlhan Worldwide Headquarters are in Hamburg, Germany.

Ergon Asphalt & Emulsions Acquires Assets of Superior Environmental Products

Ergon Asphalt & Emulsion, Inc. (Jackson, MS), an Ergon, Inc. company, has announced the acquisition of Superior Environmental Products, Inc. Effective December 28, 2007, Superior Environmental Products, Inc. (SEP), became Ergon Technical Coatings.

Although the name of the company is changing, the Novocoat product line and customer service will remain.

Ergon Technical Coatings is part of Ergon Asphalt & Emulsions, Inc. and is made up of Ertech, Innovative Adhesives Corporation, and the Novocoat product line. The new, consolidated company is positioned to provide a comprehensive line of products from asphalt emulsion, solvent based materials, to 100% solid epoxies and other latex coatings.

Ergon, Inc. owns and operates three petroleum refineries located in Mississippi, Arkansas, and West Virginia, producing gasoline, low sulfur diesel, lubricant and process base oils, asphalts, and other specialty products.

Sika Acquires Valspar Polymer Flooring Business

Sika AG has announced that its U.S. subsidiary, Sika Corp., has acquired the commercial and industrial polymer flooring business of The Valspar Corp.

Terms were not disclosed; revenue for the Valspar flooring business was $17 million for the fiscal year ending Oct. 26, 2007.

Sika Corp. said the acquisition would complement and further strengthen its North American position in the polymer-flooring market. The Valspar polymer-flooring product line includes epoxy and polyurethane chemistries.

Sika Corp., a subsidiary of Sika AG, based in Baar, Switzerland, manufactures a range of construction chemicals. Sika Corp.'s Construction Products Division, based in Lyndhurst, NJ, supplies concrete materials and restoration technologies, with a product line that includes concrete admixtures, sealants, adhesives, corrosion inhibitors, specialty mortars, epoxy resins, grouts, anchoring adhesives, overlays, and protective coatings.

ICRI Names Monica Rourke 2008 President

Members of the International Concrete Repair Institute (ICRI) elected Monica Rourke, DryWorks, Inc., as its 2008 president.

To support Rourke in 2008, the ICRI membership also elected the following officers:

- President-Elect—Randy Beard, Walker Restoration Consultants;
- Vice President—Charles Knight, Sto Corporation;
- Secretary—Don Ford, CA Lindman, Inc.; and
- Treasurer – Garth Fallis, Vector Corrosion Technologies.

2007 President Marty Sobelman, Atlas Restoration, LLC, will continue to serve on the board as Immediate Past-President.

Monica Rourke

In addition to the president and officers, the membership voted in five new board members, who will serve three-year terms effective January 1, 2008:

- Katherine Blatz—BASF Building Systems, Inc.;
- Heidy Braverman—H. Braverman & Associates;
- Jason Dunster—Walker Restoration Consultants;
- Keith Harrison—Capital Restoration & Waterproofing, Inc. and
- Pierre Hebert—MAPEI Corporation.

ICRI, a nonprofit association with more than 1,850 members worldwide, is a leading resource for education and information to improve the quality of repair, restoration, and protection of concrete and other structures.

Coatings against the Wind

What criteria should be used to select coatings for wind turbine blades? What are some suggested performance standards?

Gregory J. Malinski,
Ziegler Industries Inc.

The separate but related issue of surface imperfections must be addressed before answering this question. When defining the criteria for selecting coatings for fiberglass wind turbine blades, the contractor should know that correcting surface imperfections is typically the responsibility of the painting contractor. Before coating newly constructed blades or applying maintenance coats to blades that have been in service, surface imperfections must be corrected. In some cases, these imperfections can be significant, requiring fillers that can be applied at a thickness greater than 125 mils (~3 mm). In addition, finer-grade filling materials may have to be used to achieve a defect-free surface. The key to remember is that unfilled imperfections will appear as imperfections on the surface. Surface imperfections result in additional drag and decreased efficiency.

Aircraft coatings have been adopted by the wind industry for use on blades in onshore and offshore applications. These systems often consist of amine-cured epoxy filler and urethane finish coats. The typical coating system will include a rough fill layer to achieve final shaping and fill large surface imperfections. A fine filling procedure will follow the rough fill layer to correct minor imperfections not addressed by the first layer. After completing the filling operation, the contractor will apply the first finish coat. Inevitably, some surface imperfections will be missed in the first two filling operations. These imperfections will become apparent after the first finish coat and must be corrected by final filling before applying the last finish coat.

In some cases, vortex generators (VGs) are installed on wind turbine blades to direct wind flow over the surface of the blades and thus increase efficiency. The contractor should compare the bond strength of the adhesive used to attach the VGs to the bond strength of the coating material. If the bond strength of the adhesive exceeds that of the coating, attaching the VGs to the uncoated surface may provide superior adhesion.

The temperature range that the coating may be exposed to while in service is another important selection factor. The highest temperature in the range could be up to 130 F (54 C), with the lower limit being -80 F (-62 C). In addition, the contractor must also consider the ultraviolet light resistance of candidate coatings.

Wind turbine blades must be flexible; so too must their coatings. As the blades flex, all coating materials must not only be able to flex without fracture, but also retain adhesion to the base coat and substrate.

While flexibility is important, the contractor should also consider the abrasion resistance of coatings. In some cases, wind turbine blades are susceptible to wind-blown debris. With turbines up to 5 MW (megawatts) being installed offshore and in saltwater environments, coating environmental conditions are pushed to the extremes. Higher speeds associated with larger turbines can also result in greater abrasion to the tips of the blades.

As with any coating project, the contractor must consider the surface to be coated. Both filling and coating materials must be compatible with the fiberglass substrate.

Application of two to three fill coats and two coats of surface coatings can result in lengthy finishing times if the contractor has to wait for each coating to cure before applying subsequent coats. Therefore, the contractor should consider materials that will allow wet-on-wet application. In addition, surface coating systems that allow the application of fillers between finish coats are desirable. These systems will enable to contractor to touch up imperfections that become apparent after the application of the first finish coat.

As for performance standards, the first and foremost one seen across the wind industry is a 20-year warranty. Most manufacturers and wind farm operators are looking for a 20-year service life on all coatings. Typically, the coating manufacturer provides a warranty for the materials, and the contractor guarantees the work.

The second performance standard is associated with the finish applied to wind turbine blades. Each surface imperfection on a wind turbine blade results in additional drag, and thus, decreased efficiency. Therefore, the contractor is typically held to strict guidelines regarding the number and degree of surface imperfections.

Greg J. Malinski is vice president and co-owner of Ziegler Industries Inc., an industrial corrosion prevention, sanitation, and insulation firm. Before joining Ziegler in 2005, he was safety director at Roquette America for six years.

Historic Radio Tower Gets a New Station in Life

By Lori R. Huffman, JPCL

The last known remaining radio tower designed and built by Guglielmo Marconi, the inventor of wireless telegraphy, will continue to grace the campus of Lamar State College—Port Arthur, thanks to a restoration project that combined shop surface preparation, galvanizing, and painting. Located at the center of the campus in Port Arthur, TX, the 130-foot (39-meter) tower was designed and built by Marconi in 1909 for the college to use for wireless telegraphy training and marine communications in the Gulf of Mexico. According to Dr. Sam Monroe, president of the college, the tower was designated a historic site by the Texas Historical Commission in 1988. Over the course of many years, several attempts had been made to paint the structure to halt corrosion. However, the salt-laden environment of its Gulf Coast location had slowly taken its toll.

Above: Tower before rehabilitation
Below: After rehab

The college engaged a local engineering firm specializing in tower work to conduct a structural and painting survey and design the restoration project. Field inspections in 2000 revealed extensive corrosion of structural members and critical connections, which had weakened the structure, says Randy Reichle, vice president of the engineering company.

Based on the results of the inspection, the college launched a complicated project to save the tower. The restoration project included conducting inspections, dismantling the tower, carefully cataloging its components, and transporting the components to multiple shop facilities, where surface preparation, fabrication, galvanizing, and painting were conducted.

The engineering company originally planned to climb the tower to perform the inspections, but the questionable structural condition and safety considerations changed the strategy. Next, the company located the tallest manlift available, which was still 20 ft (6 m) too short. The proposed restoration was complicated by several findings during the inspection, says Reichle. First, the structure was so weak from corrosion that performing structural repairs, surface preparation, and painting in the field could result in catastrophic failure of the tower. Second, the tower was found to be asymmetrical, and its 360 parts had to be carefully dismantled and marked so that the structure could be successfully reassembled. According to Reichle, each member of the tower was apparently fabricated on site during the original construction in 1909. “We could see hammer marks on the segments. They had obviously been heated and formed with hammers to the various shapes. We think a large wooden scaffold was built, and the tower was raised by hand and assembled piece by peice,” he says. The engineering company had the steel analyzed and found that it was a very poor grade of early carbon steel; however, the samples withstood testing of the surface preparation, galvanizing, and painting processes that were deemed necessary to save the structure, Reichle says.

Reichle’s company designed the project so that the disassembly of the tower would take place during the college's semester break. The engineering company implemented a piece marking system and designed a disassembly procedure. The general contractor devised a bottom-up plan for dismantling the tower. Using an 80-ton (73-metric-ton) crane, the general contractor first lifted the entire tower and carefully moved it six separate times within the restricted working area at the site, removing the bottom 20 ft (6 m) at each move. Short sections of movable scaffolding were then used to disassemble and label each part.

The engineering company inspected each component at the site, determining the pieces that required replacement, those that needed further inspection or repair, and those that could proceed to the shops for surface preparation and galvanizing. Approximately 20 to 25% of the tower, including the metal fasteners, had to be replaced, says Reichle.

Photos courtesy of DSR & Associates

The challenge of the project was to meet present-day structural requirements without changing the appearance and historical integrity of the tower. To achieve this goal, the engineering firm specified the replacement of the metal fasteners with galvanized bolts and nuts (rather than welding the connections) and the custom fabrication of certain members.

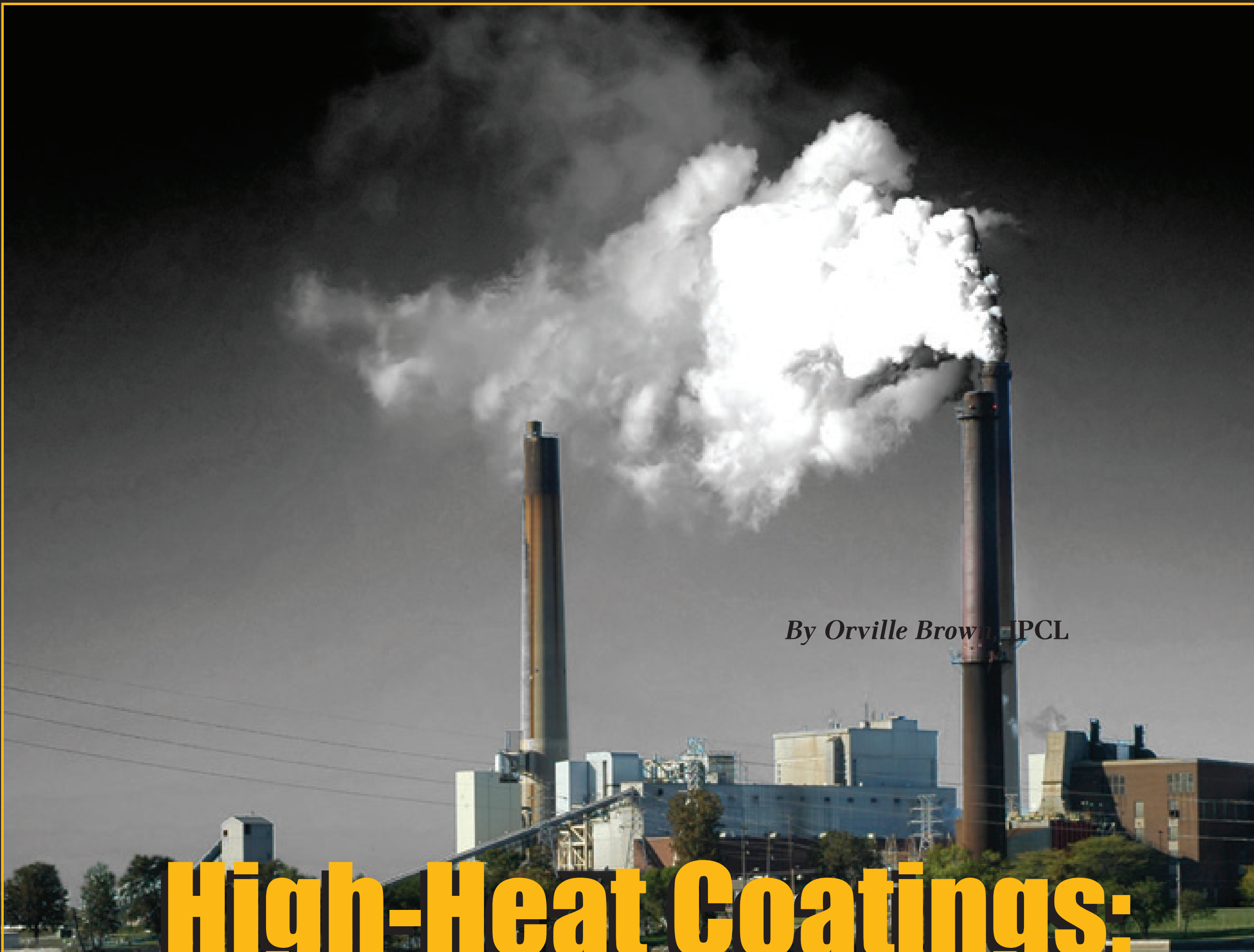
The components were transported to a shop blasting and painting facility for a commercial blast cleaning (SSPC-SP 6) to determine the extent of corrosion and deterioration. The components that could not be salvaged were taken to a fabrication shop so that they could be reproduced. Components needing repair were also sent to the fabrication shop. The remaining parts were abrasive blasted to remove all existing coatings (which were free of lead) and rust to an SSPC-SP 6 finish, after which the parts were sent to the galvanizing shop. There, they were put into cleaning baths and then hot-dip galvanized in accordance with ASTM A123/A123M-97.

Following galvanizing, the parts were transported back to the cleaning and painting facility, where they were solvent washed and brush blasted. All abrasive blasting was performed with a silica-free coal slag byproduct, Reichle says. A first coat of surface-tolerant epoxy mastic coating was applied to a dry film thickness of 3 mils (75 microns) with airless spray equipment. The engineering firm specified this layer as a tie coat between the galvanizing and the topcoat, Reichle adds. The coating contractor then applied a high-gloss polyurethane topcoat to a dry film thickness of 5 mils (125 microns).

To prevent damage to the galvanized and coated components during transporting and handling, the engineering firm specified that the general contractor use nylon slings and chokers during the re-erection operations. Only minor touch-up painting was necessary on site, reports Reichle. The field work, from start to finish, took about five weeks.

The tower is currently being considered for listing in the National Register of Historic Sites and is the centerpiece of Lamar State College—Port Arthur. The college and the tower will celebrate their centennial in 2009.

DSR & Associates, Inc. (Beaumont, TX) designed the restoration project. Water Tank Service Company (Pasadena, TX) was the general contractor. Triangle Metals (Nederland, TX) handled the steel fabrication. International Galvanizers (Beaumont, TX) performed the galvanizing. Performance Blasting & Coating (Port Arthur, TX) was responsible for the abrasive blasting and finish painting. Sherwin-Williams (Cleveland, OH) provided the coatings.



By Orville Brown, JPCL

High-Heat Coatings:

An Overview of Coating Performance and Product Characteristics

High-temperature protective coatings are designed not only to resist aggressive chemicals and corrosive environmental conditions, but also to withstand physical and chemical stresses from processes that operate under either rapid temperature cycling or sustained elevated temperatures of 400 to 1500 F (204 to 816 C). The coatings are also known as high-heat or heat-resistant coatings.

The technology for high-heat coatings is complex, and there is a range of heat-resistance capabilities for some generic coating types. This article is not intended to address such complexities but is a review of the technology for persons new to the industry or those seeking a refresher on basic technology for high-heat coatings. Specifically, this article reviews a sampling of high-heat coating technology available in the marketplace. The review is based on manufacturers' published tech-

iStockphoto

nical documentation about their products. This review illustrates the very broad technology currently used in the chemistry of the high-heat binder systems, the wide range in continuous service temperature of high-heat coatings available, and the unique coating properties available in the different technologies presently currently used in high-heat coatings. The reader should note that no attempt was made to test or otherwise verify performance claims.

Background

How do protective coatings defined as resistant to elevated temperatures (high-heat coatings) differ from conventional protective coatings that may include specific temperature resistance limitations among their other coating properties?

Suppliers of conventional coatings often (but not always) state temperature limitations in some fashion, and the limitations may be expressed in one or more of these three ways:

- continuous service,
- intermittent service, and
- resistance to dry or wet elevated temperature service conditions.

(The same language is used to describe high-heat coatings but the limits are generally higher.)

A review of technical data sheets for conventional protective coatings from several key coating suppliers indicates dry temperature resistance in the range of 180 to 250 F (82 to 121 C) for continuous service and 250 to 350 F (121 to 177 C) for intermittent service. The exception to this generalization is for two-part epoxy coatings. For epoxies not promoted for elevated temperature service, the limit of service temperature is usually not higher than 250 F. However, the epoxy coatings considered in this article (in Table 1, to be discussed later) are expressly promoted for elevated service temperature and have a service temperature limit range of 400 to 450 F (204 to 232 C).

The technology used for high-heat coatings allows the formulation of products that are suitable for satisfactory performance over a wide range of service temperatures. High-heat coatings may be safely exposed to continuous service temperatures from 400 F (202 C) to as high as 1,500 F (816 C), depending on the system. Consistent with this range of service temperature for high-heat coatings, the U.S. EPA has defined high-temperature protective coatings as follows: "High temperature coating means a high performance coating formulated and recommended for application to substrates exposed continuously or intermittently to temperatures above 202 C (400 F)."[1]

Although many high-heat protective coatings are commercially available, not many specific coating properties are listed in supplier technical data sheets, only references to general performance characteristics, such as "high chemical resistance," "suitable for water immersion," "not intended for water immersion," "excellent exterior durability"

From a practical point of view, however, what ultimately matters is not necessarily the product documentation claims for high-temperature performance. In practical terms, what matters is that the coating considered for a specific application will perform over the range of temperature and other environmental exposure conditions of that application.

Specifiers should consider at least three aspects of coating performance for high-heat applications. Two aspects of performance commonly considered are physical and chemical properties required for a specific application. But specifiers must also consider any cosmetic requirements for the coating. If the specifier requires a particular appearance for the coating, then appearance must be included in the specification. As application service temperature increases, coating materials begin to thermally degrade, and coating appearance (i.e., gloss and color) often changes in the process. Unless the high-heat coating is formulated with color pigments that can withstand the elevated service temperature without chemically decomposing, the coating color will change.

Typical End Uses

Just as the chemistry, performance, and application characteristics of high-heat coatings vary widely, so also does the range of end uses that require high-heat coatings. The following are among applications currently employing this class of protective coating products.

- Boiler casings
- Breechings
- Exhaust systems
- Furnaces
- Heat exchangers
- Kilns
- Manifolds
- Ovens
- Piping
- Process vessels
- Pumps
- Stacks

Table 1: Basic High–Heat Coating Properties

Coating	Generic Binder Chemistry	CS Temp oF (2)	Coating Type(1)	VOC g/L	DFT, Mils(4)	Key Performance Properties & Limitations
1	solvent-borne urethane	400	DTM	350	2-3	corrosion resistance
2	2K epoxy amine	400	DTM	217	6-8	resistant to salt cake and associated acid conditions
3	2K epoxy cycloaliphatic amine	425	FIN	203	7-9	immersion service-water, diesel fuel, gasoline, thermal shock resistance
4	2K epoxy phenolic amine	450	DTM	340	8	CUI, resists wet-dry cycling, thermal shock resistance
5	2K silicone-modified epoxy amine	450	FIN	312	5-6	CUI, can apply to 450 F, resists rapid wet-dry-wet thermal cycling, severe thermal shock
6	2K silicone acrylic zinc	500	PRI	516	1.0	not suitable for acid or alkaline environments
7	2K epoxy novolac	500	DTM	0	50	high corrosion, chemical and solvent resistance
8	silicone-modified alkyd	500	PRI/FIN	408	1.0-1.2	for stacks, boiler fonts, incinerators, furnaces, heat exchangers
9	modified silicone	500	FIN	414	2.0-2.5	corrosion, weathering and thermal shock resistance
10	silicone acrylic	500	FIN	570	1.0-1.6	
11	silicone copolymer	500	FIN/DTM	383	4-5	temperature indicating, apply to 450 F surfaces, adhesion to stainless without abrasive blast
12	silicone	600	FIN	371	2.0-2.5	baghouse coating, not for immersion service, CUI
13	2K inorganic copolymer	750	DTM	420	4	apply to 248 F, both atmospheric and CUI, resistance to thermal shock and thermal & wet-dry cycling
14	2K ethyl silicate IOZ (3)	750	PRI	311	2-4	SSPC Paint 20, AASHTO M300 Type 1A
15	2K waterborne alkali silicate IOZ (3)	750	PRI	0	3-5	tank lining
16	siloxane	750	FIN	335	1-2	cures at ambient temperatures, good weathering , not for thermal cycling service
17	silicone rubber	800	FIN	611	1.5-2.0	for stainless steel, excellent thermal shock resistance
18	silicone	1000	FIN	420	0.8-1.0	requires 450 F cure to achieve full properties
19	moisture-cure silicone	1000	FIN	495	1	moisture cure-bake not required between multiple coats
20	2K waterborne inorganic zinc	1000	PRI	0	1.5	requires 200 F cure for 2 hours
21	2K modified silicone copolymer	1000	DTM/PRI	292	4-5	CUI, high build, corrosion inhibitive
22	silicone	1000	FIN/DTM	372	1.5-2.0	severe thermal shock and corrosion resistance, adhesion to stainless without blast preparation
23	silicone-ceramic	1000	DTM	336	1.5-2.0	meets MIL-P-14105, intermittent service to 1600 F, outstanding thermal shock resistance
24	modified silicone	1000	FIN	467	1.5-2.0	requires heat cure, several colors available
25	self-cure IOZ (3)	1000	FIN	395	3-8	suitable for splash & spillage, many solvents and nuclear radiation
26	2K silicone zinc	1000	PRI	413	1.5-2.0	outstanding resistance to corrosion and thermal shock
27	proprietary	1000	PRI	420	5-15	service apply to clean rust, apply to 500 F, for atmospheric service
and						and CUI, several colors available, resistant to thermal cycling,
28	waterborne silicone	1100	FIN	60	1.5-2.0	adhesion to metal and ceramics.
29	modified silicone	1200	FIN	467	1.5-2.0	colors: black and aluminum, requires heat cure
30	waterborne inorganic-ceramic	1500	DTM	0	1.0-2.0	colors: black and stailness steel

(1) COATING indicates whether the product is a finish (FIN), primer (PRI) or a DTM=direct to metal (self priming finish)
(2) CS=continuous service temperature; C=5/9 (F -32)
(3) IOZ = inorganic zinc
(4) DFT=Recommended dry film thickness per coat; 1 mil ~ 25 microns

Chemistry and Properties of High-Heat Coatings

Table 1 lists characteristics of selected commercially available high-heat coatings identified by their manufacturers as such in technical data sheets and other published product documents.

The table does not include all high-heat coatings commercially available. Rather, the table reflects only a sampling of the characteristics of products available from several U.S. suppliers of high-heat coatings. Selected from a much larger pool of products, the coatings are listed because they represent the wide range in technology commercially available. Again, these coatings are recommended for elevated temperature applications ranging in continuous service temperature from 400 to 1,500 F (204 to 816 C). Key characteristics of the coatings listed are summarized below.

Table 1 indicates following:

- the binder types used in coatings described by suppliers as suitable for high-heat applications;
- the maximum continuous service temperatures for the coatings;
- the maximum volatile organic compound (VOC) levels for the coating;
- the recommended dry film thickness per coat; and
- selected key coating properties of each.

The Table also indicates how a specific coating product is to be employed in the final coating system applied, whether it is to be a finish coat (FIN), a primer (PRI) or a self-priming coat, i.e., can be applied direct to metal (DTM), either as a single coat or in multiple coats.

Piping and process vessels are among the components of a chemical processing plant that may require high-heat coatings.
Photo courtesy of Carboline Company

VOC Requirements

In addition to meeting the specified coating cost and performance requirements, the coating selected must also comply with all applicable regulatory requirements, including the VOC level allowed.

Just as there is a broad range in properties and characteristics of the high-heat coatings, so also do VOC levels vary in high-heat coatings, from a low of zero to a high of 611 g/L.

Specifiers must be careful not to consider a potential product on the basis of its VOC content alone. It is very likely that the specific coating properties required for a particular application may limit the suitable coating chemistries to a very selected class of raw materials and may require advanced formulating technology to achieve the desired coating performance. These specific product requirements may dictate formulation of a final product that is well above the VOC levels of other high-heat coating products with different performance capabilities.

Binder Chemistry

The binder chemistries of the high-heat coatings are familiar to those knowledgeable about the chemistry of conventional, high-performance protective coatings. Binder chemistries in listed in Table 1 include the following.

- Acrylic
- Alkali silicate
- Ethyl silicate
- Modified silicone
- Solvent-borne urethane
- Silicone
- Two-component epoxy amine

It is also apparent that the binder chemistry of high-heat coatings changes as the maximum service temperature capabilities increase. A very broad range of coating binders (alkyd, polyurethane, epoxy, etc.) can be used for conventional protective coatings that are to be exposed to service temperatures up to 200 F (93 C). The user can select the coating vehicle that meets the required cost and coating performance requirements. However, as service temperature increases, the binder options narrow; when the service temperature exceeds 800 F (427 C), only a few binder choices are currently available.

Also evident is the dominant role that silicone and silicate chemistries play in high-heat coatings. At lower service temperatures within the range of high-heat coatings, (i.e., up to 500 F, or 260 C), silicone resin chemistry is the modifying resin that improves temperature resistance of non-silicone coating binders. Continuous service temperature of protective coatings not recommended for high-heat applications is usually 250 F (121 C). However, with silicone modification, continuous service temperature can be increased by as much as 250 degrees F, to a high of 500 degrees F. Also apparent in Table 1 is that for service temperature resistance of 600 to 1,500 F (316 to 816 C), only silicone or silicate binders are used.

For conventional protective coating primers, two-component (2K) epoxies are probably the most common binder chemistry because of the 2K epoxies' greater potential for chemical resistance compared to alkyd and vinyl primers previously used. The same could be said for 2K epoxy finishes, with the understanding that they are usually limited to interior applications or for exterior applications that permit the shift in color and loss of gloss common to bisphenol-A based epoxy finishes. As is also apparent in Table 1, with such 2K epoxy resins developed for high-heat applications, they are often phenolic- or novolac-modified for improved heat resistance.

For the intermediate levels of elevated service temperatures, (e.g., up to 500 F, or 260 C), one would expect 2K epoxy products to play a dominant role in high-temperature coatings requiring a broad range of chemical and solvent resistance, and the potential for formulation to very low VOC, certainly 100 g/L or lower. The potential for low VOC high-heat epoxy coatings should be readily attained through the use of either high-solids or waterborne epoxy technology. And perhaps those products have been commercialized but do not have widely available documentation. Such low VOC 2K epoxy coatings are not reflected in Table 1.

Many properties may be needed in a high-heat maintenance coating, such as color stability, surface tolerance, corrosion resistance, and high-temperature application, as on the crude oil heater unit at this refinery. Photo courtesy of Dampney Co.

The wide range of chemistries available, especially in the curing agent side of 2K epoxy systems, allows for formulation of products that can withstand attack from aggressive chemicals for splash and spillage as well as immersion applications.

Coating Systems

Notice that some coatings in Table 1 are primers, some are topcoats, and some are self-priming. One must insure that all components of the coating system will withstand the service temperature requirements of the application in question. To have a topcoat that is recommended for the particular application, but a primer that falls short in service temperature resistance is inviting cohesive failure within the primer or adhesive failure at one of the two interfaces of a two-coat system.

Application Characteristics

Most of the high-heat coatings may be applied by the methods commonly employed for conventional coatings, primarily air and airless spray, and roller. However, one must consult the specific product technical documents and the manufacturer to learn of any application limitations. In some situations, site management may prohibit spray application due to safety or other considerations. Under such circumstances, some high-heat coatings can be applied by brush or roller.

Many of the surface preparation requirements of conventional protective coatings also apply to high-heat coatings. In field application for maintenance coating, existing, aged coatings usually must be removed and surfaces must be properly prepared for application of the high-heat coating. Once the existing coating is removed, the steel must be abrasive blasted to the profile specified by the coating supplier. Abrasive blasting is also usually required for application of high-heat coatings for new construction.

Silicone coatings applied at relatively low DFT of 2 mils (50 microns) or less usually require exceptional rigor in surface preparation. In addition to achieving the specified blast profile, the contractor must eliminate surface irregularities—such as weld spatter, sharp and rough edges—to avoid creating a thin area or point in the film that will become a site of premature failure.

When site management prohibits abrasive blasting, surface-tolerant high-heat coatings may be specified.

A characteristic unique to many silicone coatings applied to stainless steel is that abrasive blasting is not always required. Proper cleaning by removal of surface contamination is always necessary, but that practice may be the only surface preparation required for a specific coating. Of course, one must always consult the product technical documentation and the supplier's technical staff to confirm the surface preparation requirements for a coating specified for a particular application.

Recommended dry film thickness also varies widely, depending primarily on the binder chemistry of a given high-heat coating. Coatings for lower service temperatures are designed for application at higher dry film thickness (DFT), from 5 to 9 mils (125 to 225 microns) or higher, while those employed for higher service temperature usually specify a lower DFT, in the range of 1 to 2 mils (25 to 50 microns). These lower thickness limitations for higher service temperature applications are usually associated with the chemical reactions that occur during film formation, requiring the release of volatile components (water for silicones) and the need for moisture for cure (e.g., ethyl silicate). Excessive thickness of silicones can result in foam defects in the coating; excessive thickness of ethyl silicate-based coatings can result in slow or inadequate cure, which can compromise film integrity,

Coating 27 in the Table is a noteworthy exception to the DFT limitation of coatings designed for service temperatures as high as 1000 F (538 C). This coating is recommended for application at 5 to 15 mils (125 to 375 microns), depending on the substrate condition, total coating system composition, method of application, and performance requirements. Also, when application site management prohibits the use of abrasive blasting, this coating can be applied to cleaned, rusty surfaces. However, as with most surface-tolerant coating systems, long-term performance is consistently improved with increasing quality of surface preparation.

Finish Color Availability

For those applications with specific color requirements for the finish coat, several silicone finishes are available in a wide range of colors, using color pigmentation that is stable up to 1000 F (538 C). Coatings 22 and 24 are examples of products from different suppliers offering a broad range of finish colors that are heat stable to 1000 F.

Refineries may use different types of high-heat coatings, including temperature-indicating products sometimes. iStockphoto

Unique Properties of High-Heat Coatings

Several properties that conventional coatings lack are found in the capabilities of high-heat coatings

- Application to hot surfaces
- Suitable under insulation (CUI)
- Temperature-indicating
- Elevated temperature for chemical cure
- Resistance to temperature cycling, thermal shock, and wet-dry cycling

Application to Hot Surfaces

Conventional protective coatings are usually designed and recommended for application to surfaces one ordinarily encounters in routine field application conditions, from 50 to 90 F (10 to 32 C). Other coating systems designed for low-temperature cure allow for application down to about 20 F (49 C). Still others often provide thinning or application adjustments to allow application to surfaces with temperatures reaching 120 F (49 C).

However, some high-heat coatings are recommended for application to substrates at very elevated temperatures. Table 1 indicates that some high-heat coatings can be applied to substrates as hot as 500 F (260 C). This characteristic would allow field maintenance painting while the high-temperature process is in operation. Some high-heat coating suppliers report successful brush and roller application to hot surfaces in situations where site management does not allow spray coating application.

Obviously, coating crews must exercise extreme caution when applying solvent-borne coatings to such hot surfaces, to avoid hazardous conditions that can cause serious accidents.

Applicators and specifiers must consult with coating suppliers that recommend application of their products to insure all aspects of coating application are strictly understood and followed to avoid potentially lethal consequences.

Coatings under Insulation (CUI)

Coatings under insulation (CUI) are niche high-heat products that must be designed for this end use. This special and complex coating category deserves greater attention than possible in this article, but CUI will be discussed briefly because some coatings that are promoted for high-heat applications are also recommended for CUI. The reader is cautioned that just because the product is classified here as a high-heat coating does not imply that is suitable for CUI applications. For that matter, some of the high-heat coatings in Table 1 are specifically not recommended for CUI applications.

To more effectively maintain process temperatures, insulation is often applied to pipes and vessels that operate up to 575 F (300 C). When breaks occur in the insulation, moisture can penetrate the system to the underlying steel, resulting in very aggressive corrosion conditions. Coatings intended for this application require resistance to degradation under conditions of both high temperatures and superheated steam. Both conditions are very aggressive in degrading the underlying coating and promoting corrosion of the underlying steel. So the coating to be applied must be designed for this particular application.

One specific performance requirement for CUI that may be useful for other coating applications is resistance to rapid wet-dry-wet cycling. Coating 5 is one example that is described as suitable for CUI and as highly resistant to continuous or rapid wet-dry-wet cycling.

Several coatings listed in Table 1 are recommended for CUI applications (coatings 4, 5, 12, 13, 21, and 27). Note the differences in continuous high temperature service of these products, from 450 to 1,000 F (232 to 538 C). The epoxy products (coatings 4 and 5) are limited to 450 F, whereas products based on silicone binders and an inorganic copolymer binder are suitable from 600 to 1,000 F (316 to 538 C).

Temperature-Indicating Coatings

Specialty coatings that "detect and respond actively to changes in its environment...in a functional and predictive manner" are referred to as "smart" or "intelligent coatings."[2] Some high-heat coatings are a type of smart coating. That is, a few of the high-heat coatings in Table l are designed to change color when subjected to increasing temperatures. The visible change in the color of the coating alerts facility owners or maintenance staff to process or equipment hot spots that otherwise may go unnoticed for a period of time.

In the case of temperature-indicating coatings, one way of manipulating the chemistry of the coating to change color at a specific temperature is to select a color pigment known to undergo a chemical reaction at the specified temperature. With most color pigments, any change in the chemical composition produces a shift in color, in some cases, a radical shift. The problem of identifying a coating that changes color at a target temperature then becomes one of first selecting a coating that otherwise provides all required coating requirements for that application and then formulating the coating with a color pigment that undergoes thermal decomposition at the target temperature.

Coating 11 in Table 1 is an example of a temperature-indicating coating (TIC). The coating has been designed for applications in the temperature range of 400 to 600 F (204 to 316 C). When used in refinery and petrochemical process equipment operating at elevated temperatures, the color change of the product gives an early warning of a vessel overheating due to failure of refractory linings or bypassing of hot gases. The product is available in two colors that change color at different service temperatures. Color changes within a temperature range of 25 to 50 F (14 to 38 C) for both colors. A yellow version undergoes visible color change from 475 to 525 F (246 to 274 C) whereas a blue variation undergoes the color change from 675 to 725 F (357 to 384 C).

Coatings Requiring Elevated Temperature for Chemical Cure

Most high-performance protective coatings undergo chemical crosslinking to achieve their ultimate performance properties. Two-part high-solids and lower VOC products like urethanes and epoxies remain liquid until mixed and applied. Chemical crosslinking proceeds at ambient temperature from the time of mixing and continues after application, usually several days or more, until crosslinking has advanced to the point at which ultimate coating properties have been developed.

Some one-component products develop film hardness soon after application without crosslinking but require a subsequent chemical cure to achieve ultimate performance properties. Most one-part, silicone resin-based high-heat coatings fall into this category. As indicated in Table 1, coatings 18, 20, 24, and 28 require a heat cure to achieve their ultimate properties. For any of these products, the coating should be applied to a process unit that normally operates at elevated temperatures. The coating should be applied while the unit is inoperative, and would air dry to a relatively hard finish, but ultimate coating properties will not have developed. When the unit is started and its surface temperature rises to the operating temperature, in-situ crosslinking of the coating will occur, and the ultimate coating properties will develop at or below the unit operating temperature, depending on the specific chemistry of the crosslinking reaction.

High Resistance to Temperature Cycling, Thermal Shock Resistance

In addition to maintaining high performance upon continuous service at temperatures of 400 to 1,500 F

(204–816 C), several of the coatings in Table 1 are designed to perform under very stressful cyclic thermal conditions of rapid changes in substrate temperature, a condition referred to as thermal shock.

Typically, such coating products will not fail when coated process units undergo rapid temperature cycling from ambient conditions up to their published continuous service temperature limits. For example, Coating 5 can be subjected to cyclic temperature fluctuations from ambient to 450 F (232 C) without coating failure. Coating 13 can withstand cycling between -20 and 752 F (-29 C and 400 C). Coating 26, recommended for continuous service to 1,000 F (538 C), will withstand severe thermal shock from ambient to 1,000 F (538 C), with temperature peaks to 1,200 F (648 C).

Metalized Coatings

A thorough review of metalized coatings (or thermal spray coatings) is beyond the scope of this article because they differ from conventional high-heat coatings in many respects. But metalized coatings must be considered briefly here as a technical alternative for high-heat coatings.

Thermal sprayed metal coatings have a long history of use in the petrochemical industry and offer an alternative to liquid coatings, solvent- or waterborne. Metalized coatings are applied by a thermal spray process that melts metal wire (aluminum, zinc, or zinc aluminum) as it passes through a flame and then to the substrate. A metallic coating is formed as the molten metal impacts the substrate, flows out into a uniform coating, and solidifies into a metal film.

Thermal spray aluminums (TSA or zinc aluminum) are well suited to high temperature cyclic service in the petrochemical industry for applications such as flare stacks and coker units. Thermal spray coatings are one of the coating materials found to provide corrosion protection for more than 15 years.[3]

Thermal spray coatings are described in more detail in other articles.

Conclusions

High-heat coatings play an important role in the protective coatings marketplace. This review reveals the broad range of binder chemistries available for meeting the varied coating performance requirements of typical industrial environments where temperatures may range from ambient to 1,500 F (816 C).

This study has also illustrated the broad range in coatings technology available to the user of high-heat coatings. The foremost features of this niche coating class are the broad range of substrate protection offered and dry film thickness capabilities that range by a factor of 10, from 1 to 10 mils (25 to 250 microns), or even higher.

The unique features of application to hot surfaces and minimal surface preparation requirements of selected products are especially beneficial to users that must refinish systems while in operation at elevated temperature and which do not permit the use of abrasive blasting.

As a further observation, specifiers who wish to select from a variety of products can efficiently begin their the selection process by gathering technical data sheets from manufacturers of high-heat coatings. Data sheets can help specifiers formulate their questions for the manufacturers. Well-written technical data sheets document the generic chemistry of binders, coating application, and key performance characteristics of each product. But specifiers should always speak to the supplier of each product before making a selection. And of course, not all technical data sheets contain the same kinds of information, so again, speaking with the suppliers is critical.

References

1. 40 CFR 59:400-413.
2. J. Baghdachi, "Are Smart Coatings Getting Smarter," *JPCL* November 2007, pp 9-11.
3. See, for example, Problem Solving Forum, "Using Thermal Spray in Petrochemical Facilities: When Is It Cost Effective?" *JPCL* March 2005, pp. 48-50.

Orville Brown has worked widely in the coatings industry. Among the positions he has held are Corporate Director of Research and Development and Purchasing, Diamond Vogel Paint Co.; Vice President, Research and Technology, North America Heavy Duty Group, Courtaulds Coatings (Now Akzo Nobel); and Corporate Technical Director, M.A. Bruder (now MAB Industrial Coatings). He is now a technical editor for *JPCL*. He has published and presented a number of articles and papers on coatings technology. He holds an M.S. in Chemistry.

Effective Contract Administration

Third in a Series

Contracting Issues:

Are Owners Getting What They Ask for?

By Joseph H. Brandon; and Michael P. Damiano,
SSPC: The Society for Protective Coatings

Do you have problems with your competitively bid contracts? Are your contract results unpredictable or perhaps predictably variable? Do you have anxiety attacks at the mention of having to award a new contract? Do you feel that as the owner you have little control over contract results?

If you answered "yes" to any of these questions, you probably do not have your contract requirements and contract administration aligned to ensure that you pay only for work based on documentation (objective evidence) of conformity. You, the owner, control the specification, the contract administration, and the acceptance of work; therefore, you have the ability to require all controls necessary to produce the desired results with the least amount of misunderstanding or argument. Further, there is nothing in contract law that gives contractors control of projects, because contract law has evolved over the ages to result in fairness and evenness.

An owner lacking control of the contracting processes may actually be giving up some legal protections,

iStockphoto, photographer Narvikk

because the courts place higher burdens on the entities that control the specifications. (See for example http://www.lhfconstructlaw.com/CM/Articles/Articles129.asp.) Owners requiring documentation of conformity to contract requirements will achieve better results on their jobs and get more support from the courts in legal disputes.

This article continues the discussion about new tools and methods for coating contracting, such as the use of corrective action (CA), that began in the January 2007 *JPCL* and continued in the August issue with an article about the value of a quality management system (QMS). Here, we review the concept of paying for work based on documentation of conformity to contract requirements.

Owner-Driven Inspection vs. Contractor-Driven Process Control

The culture surrounding the construction industry continues to place high value on ensuring technical conformity through some form of owner-driven inspection, even though the quality

Contract Administration
Third in a Series

community has been telling us for more than 50 years that it is much more efficient and effective to ensure conformity through contractor process control. Misunderstandings about process control—what it can and should do—have probably limited its use in the construction industry. Therefore, we will review how process control techniques can be used to make contracting easier and simpler while achieving better results.

Using contractor process control in no way reduces the use of inspection on a construction project. However, it requires that inspection be an integral part of the contractor's quality control (QC) system, rather than a part of contract administration. This requirement does not mean that contract administration should forgo the use of available technical specialists in performing its quality assurance (QA) function; their use, however, is not absolutely necessary.

The rationale behind contractor QC has its basis in contract law, where it is implicit that the contractor tender only conforming work. If the contractor does not have qualified inspection personnel, how can it be assured of tendering only conforming work? An efficient owner contract administration

Summary of Important DOs and DON'Ts in Coatings Contracting

Item	Consequences
Do expect the contractor to plan and prepare to produce only conforming work, and to address all nonconformities with Corrective Action (CA).	The most fundamental of the expectations from contract law is that the contractor should tender only conforming work. To allow any less is to encourage "less than satisfactory" planning and preparation. Each time this occurs, it will add to the contractor's perception that the owner does not value the finished product. When requiring a Quality Management System (QMS) certification, it is reasonable to expect that only conforming work will be produced, and that all nonconforming work will be addressed through CA to eliminate the root cause once and for all.
Do insist on objective evidence of conforming work before paying for the work. In addition to appropriate inspection documentation, require contractor certification of conformity with each invoice and final payment.	Insisting on objective evidence of conforming work ensures that the work is traceable to specific processes and verified results. This type of recordkeeping is one of the important parts of providing documentation to support warranty and latent defect claims in the future and can be used to prosecute for fraud.
Do enforce the specification.	If anyone, including the contract administrator, the contractor, etc, dislikes any portion of the specification, it should be changed, or it must be administered as it is. Informal changes only diminish the importance of the specification and create legal problems for implementing the remainder of the specification.
Do not make any technical change without the approval of the designer or other designated technically qualified representative.	Unauthorized changes risk adversely affecting the product if the changes are made by nonqualified personnel. This is a major cause of contracting problems in all industries. These changes also risk giving the contractor the impression that the owner does not care about quality.
Do not accept any contract change without executing appropriate change documentation (change order*).	These actions may be some of the most detrimental that a contract administrator can take, as they encourage poor planning. Do everything possible to encourage good planning and to avoid encouraging poor planning. Poor planning can become insidious very quickly.
Do not consider accepting nonconforming work.	
Do not accept nonconforming work.	

* The change order process is a necessary and viable process, and it should be used to record all changes to the contract requirements.

system should make use of the contractor's inspection, not duplicate it.

Inspection's Place in Coatings Contracting

Inspection has several well-defined and important functions in coatings contracting, but the practice of utilizing full-time owner inspection, which probably developed from the construction industry practice of assigning engineers to construction projects to ensure structural integrity, has led the coatings community to design inspection programs that are not necessarily efficient. The widespread use of owner-inspection has mistakenly led to contractors not being required to have qualified inspectors of their own on each project, and, consequently, has allowed contractors to avoid their legal responsibility to tender

Glossary

- Competent design: cost-effective design that encompasses all of the pertinent scope and technical requirements for which the owner is willing to pay. Implied in this definition are all general and specific qualifications and experience required for the designer to perform competently.
- Conform/conformity: fulfillment of a contract requirement
- Correction: action to eliminate a nonconformity (i.e., fix the problem)
- Corrective action: correction of a nonconformity, with action to identify and eliminate the root cause of the nonconformity
- Deviation: a change to the project specifications, often used interchangeably with the term variance. Generally, requests for deviation from project specifications should be submitted during the planning process, and the only such requests that should be considered during the production phase are those where unforeseen conditions are uncovered during production. Any hidden site conditions that were not known at the time of bidding but could reasonably be discovered before production should be addressed in the planning phase.
- Non-conforming work: interim or final work that fails to fulfill contract requirements and requires rework or repair, or must be scrapped
- Objective evidence of conforming work: documented evidence (records) of conformity to all contract requirements
- Quality assurance: all of the actions required by the owner to ensure contractor conformity to requirements. This can include any combination of inspection of the work and monitoring/auditing of the contractor's objective evidence of conformity. Quality assurance is performed as the work progresses, and the results are used to address nonconformities in either the work or the quality management system, and to assist in approving invoices and accepting work.
- Quality control: "performing the necessary observations, testing, and documentation to verify that work performed meets or exceeds the minimum standards established by the project specifications or contract. QC is the contractor's responsibility." (Kaelin, April 2005 *JPCL*, p. 59)
- Quality management system (QMS): a system of general or specific policies and procedures intended to improve and control the various processes that will ultimately lead to improved business performance
- Tender: to offer for acceptance and payment
- Work: includes, but is not limited to, materials, workmanship, manufacture, and fabrication of components

only conforming work. This current practice places the burden of inspection and acceptance/rejection entirely on the owner's inspection staff and encourages a high potential for accepting non-conforming work.

The contractor should have qualified personnel on its staff (minimum SSPC-QP 5—Level 2, SSPC PCI-certified, or NACE-certified, plus any additional requirements appropriate to the specific project) to inspect the in-process and completed work. Requiring the contractor to provide primary inspection and to tender only conforming work allows the owner to design a wide variety of QA programs that are focused on ensuring that the contractor performs satisfactorily.

Implementing Procedural Conformity

Procedural conformity is a contracting philosophy based on the contractor's responsibility for conforming to contract requirements. It follows the assumption that ensuring conformity to requirements and documenting that conformity can most efficiently be done by the contractor. It also allows contract administration to effectively use non-technical personnel to perform QA.

Because the contractor is responsible for all planning and preparation for production of conforming work, inspection of that work, and documentation of conformity to requirements, the contract administrator can perform QA on procedural conformity rather than on technical conformity of specification requirements. To implement procedural conformity, the contract administrator must mandate the following points.

• Require a quality control (QC) system based on consensus standards

Contract Administration
Third in a Series

(SSPC-QP 1, ISO 9001, etc.).
- Require a QC system structure with a QC manager who is responsible for all planning and preparation for production of conforming work.
- Require qualified inspectors to be hired by the contractor and to work as part of the QC system team.
- Require submittals that ensure appropriate materials and processes are used in the project.
- Require that all submittals be QC approved, rather than owner approved, but reserve the right for the owner to review submittals and to inspect the work, and have the designer/specification writer review all submittals involving technical requirements.
- Require the contractor to notify the contract administrator within a reasonable time after contract award of errors, omissions, and other discrepancies to allow the contract administrator to consult with the designer to resolve discrepancies during the planning phase of the project.
- Require a work plan of detailed, project-specific process procedures, and require that all work be accomplished and inspected in accordance with the approved procedures.
- Require the contractor to develop and use inspection report forms. These forms should include all requirements, acceptance criteria, precise description and location on the structure of inspected work, indications of conformity or nonconformity of each inspected item or area, and verification of transfer of nonconformities to the rework and Corrective Action (CA) logs.
- Require that the contractor develop CA procedures and initiate CA upon identification of each nonconformity. CA shall consist of remedial action to stop production of nonconforming work, correct the nonconformity, identify the root cause of the nonconformity, eliminate the root cause, and follow-up to ensure that the root cause has been eliminated.
- Require that invoices include only work that has been documented and certified by the contractor as conforming.
- Require that the contractor certify conformity to all contract requirements as part of the final invoice after the final inspection and comple-

Contract Administration

Third in a Series

tion of all punch-list items, but before final payment.

Submittals

In this process, the contractor develops and maintains a submittal log to show the status of each submittal. The contract administrator monitors the submittal log for conformity to procedural requirements, i.e., the contractor's submittals are procedurally complete and timely in advance of final planning and preparation for work.

This process does not prevent the owner from making a complete technical review of the submittals, but such review is not required. Any owner review of documentation for QA purposes is for added assurance only.

> ***Newly arising nonconformities indicate planning and preparation problems.***

Work, Inspection, and Documentation

As the contractor proceeds through verifying procedures and moves into the production phase, the QA function concerns the auditing of inspection reports and associated logs for completeness in the following.

- Indicating conformity or nonconformity of each inspected item;
- Transferring each nonconformity to the rework log;
- Initiation of CA for each nonconformity;
- Identification of the root cause of each nonconformity and elimination of that cause;
- Follow-up to ensure that each root cause has been eliminated for the

remainder of the contract; and
- Clearing of all items on the rework and CA logs.

It is neither intended nor necessary for inspection reports to be 100% monitored for conformity, as auditing (sampling techniques) can be utilized to reduce this effort to a review of 5—10% of the reports.

Auditing for Conformity

When requirements for documentation are appropriately established to encompass the planning and preparation functions, as well as the production functions, almost any competent individual, technical or non-technical, can perform QA audits that can provide a significant level of confidence in the contractor's performance to contract requirements.

Nonconformities As a Function of Planning

An owner should expect a certified contractor to produce only conforming work or to pursue CA procedures and eliminate the root causes of problems very quickly. Newly arising nonconformities indicate planning and preparation problems. The reappearance of root causes after initial elimination is an indication of major planning and preparation problems. The owner should address these problems with CA requests to the contractor to fix its quality control system. When production problems are significant, or if the CA process does not correct the problems very quickly, the contractor should discontinue production and return to the planning and preparation phase to modify existing procedures or to develop and verify new procedures before proceeding with production once more.

A contractor can return to the planning and preparation stage an unlimit-

ed number of times. However, each time the contractor revisits this stage, the relevant contractor personnel must verify all changed procedures and all downstream procedures dependent upon the changed procedures. When an owner cannot afford to allow the contractor multiple opportunities to return to the planning and preparation process, particularly during the transition to the use of procedural conformity, the owner should make extra efforts to make the time factor known throughout the solicitation process and should use all of the available tools to monitor the contractor's progress early in the contract. The requirement for a work plan is one particularly appropriate tool for determining the contractor's qualifications and capabilities. When used with CA to address any and all planning and preparation issues, an owner can determine very early in the process whether the contractor has the capabilities to perform satisfactorily.

> ***"The completion stage is the time to ensure that all nonconformities have been corrected, with the sole exception being punch-list items that are tracked for near-term correction."***

Correcting Nonconformities Before Job Completion

The completion date marks the effective end of work and beginning of any warranty or correction periods. The completion stage is the time to ensure that all nonconformities have been corrected, with the sole exception being punch-list items that are tracked for near-term correction. The owner's rep must ensure at completion, and especially upon paying the last invoice, that he/she does not know of, or have the opportunity to know of, any remaining nonconforming work other than tracked punch-list items.

The most effective way to assure that nonconformities are corrected is to require the contractor to certify that all invoiced work conforms to contract requirements, and to either provide or reference documentation of conformity. The contractor should be required to perform the following tasks.

- Inspect and document all work for the purpose of tendering only conforming work.
- Note nonconformities on inspection reports and transfer the information to a rework log, or equivalent.
- Correct all nonconformities and re-inspect to verify correction.
- Document conformity and annotate the rework log.
- Invoice for conforming work.

The contract administrator avoids the burden to prove nonconformity when it mandates that the contractor produce conforming work as a requirement of payment. To achieve this goal, the owner must ensure that the contract specification includes appropriate procedural requirements for documenting conformity to each requirement and ensure that the contractor conforms to every procedural requirement.

Contract Administration
Third in a Series

By requiring the contractor to track its performance through submittal, inspection, test, and rework logs, the contract administrator will have much, if not most, of the information that is needed to monitor contract performance and assess the need and timing for QA actions. When the contractor tracks performance appropriately, the resulting documentation will be complete and accurate and will provide full traceability of the work.

"The owner must ensure that the contract specification includes appropriate procedural requirements for documenting conformity to each requirement and ensure that the contractor conforms to every procedural requirement."

Summary

The prevailing belief in the coatings industry is that if the owner doesn't inspect the work, it can't be assured that the work conforms to contract requirements. This theory is flawed, because there are other methods of ensuring conformity. Even more important, however, is that the owner's rep will have a difficult time arguing for a latent defect claim in the future if he/she inspects the work and fails to detect a nonconformity that "could have been detected." This risk has a significant impact on federal agencies, where acceptance of work is final except for latent defects, fraud, and gross mistakes amounting to fraud. Most state contracting laws provide more options for owners (non-federal public agencies as well as private owners) to get nonconforming work corrected.

Most public agencies are already making use of QMS concepts and, as such, are writing specifications that signify procedural instead of technical conformity. This is especially true of the Department of Defense facilities' guide specifications that have been in use since 1973. Yet, the switch from a contracting philosophy based on technical conformity to one based on procedural conformity requires further development of contractor-based quality control systems and contractor responsibility for inspecting to conformity.

When administered appropriately, procedural conformity will discourage contractors that do not intend to conform to all requirements, leaving the contracts for quality-oriented contractors. This is a win-win scenario for owners and creates a level playing field for contractors.

Joseph H. Brandon recently retired from the position of protective coating specialist for the Naval Facilities Engineering Service Center (NFESC) in Port Hueneme, CA.

Michael P. Damiano is the director of product development at SSPC in Pittsburgh, PA (damiano@sspc.org).

PACE 2008: SSPC Awards Light Up Los Angeles

At its Annual Meeting at PACE 2008 in Los Angeles on January 27, SSPC honored many members for their significant and diverse contributions to the protective coatings industry.

Awards were given for local chapter achievements; innovations that advance the industry; coated structures that demonstrate excellence in coating work; individual achievements; and excellence in writing about the protective coatings industry.

Chapter Actions, Industry Innovations Honored

Local chapter honors went to the following:

- The Southern California/Southern Nevada Chapter received the Outstanding Chapter Award.
- The Hampton Roads Chapter won the Educational Excellence Award.
- The Northern California/Nevada Chapter received the Breakthrough Chapter Award.

A new prize, the Innovation Award, went to the Iowa Waste Reduction Center for its Virtual Paint™ Simulator, which uses computer technology to allow painters to train or practice spray technique without using paint.

Member Achievements Heralded

Jerry Brock

Jerry Brock of Brock Enterprises received the Honorary Life Member Award for his 50 years of work in the industry.

Among his accomplishments are building an internationally recognized contractor company, advancing the protective coatings industry, and dedicating many years to support the work of SSPC. He served on SSPC's board from 1994 to 1999.

Hugh Roper of Wheelabrator won the Technical Achievement Award for his contributions to SSPC committee work and consensus standards as well as for his research into abrasives, surface profile, and surface preparation overall.

Two people tied for the Coatings Education Award. Hiromi Yamaguchi, SRF and JRMC DET SASEBO, and Earle A. Epperson of Shinko Company received honors for their work introducing and teaching SSPC courses in Japan.

Earle Epperson

Harold Hower of Technology Publishing/PaintSquare received the John D. Keane Award of Merit for his initiative in building SSPC individual membership, convening the first national SSPC conference, and launching the *Journal of Protective Coatings & Linings*.

Dr. Harold Hower

Danny J. McDowell (Northrop Grumman), SSPC past-president, received a certificate of appreciation.

Coating Excellence Recognized

SSPC also gave out the second annual Structures Awards, which recognize outstanding work in four categories of recently coated structures. The Society

Continued

SSPC's New Master Coatings Inspector Program Recognizes Inspector Achievement

At PACE 2008, SSPC introduced its Master Coatings Inspector program, which is solely intended to recognize and honor those individuals whose experience and training has afforded them the prestige of multiple inspector certifications.

In 2005, SSPC released its one-of-a-kind Concrete Coatings Inspector (CCI) program, which was developed to fill a gaping need that SSPC members identified.

The CCI program led to the 2006 release of the Bridge Coatings Inspector (BCI) program, designed to help owners put the ultimately qualified bridge inspector on the job site.

In 2007, SSPC released the Protective Coatings Inspector (PCI) program to answer the industry's need for a comprehensive, challenging, and efficient course that would minimize the professional's time away from the job site, but maximize the knowledge gained in the classroom.

The three courses described above, combined with the SSPC-administered NAVSEA Basic Paint Inspector course (NBPI), form the nucleus of the SSPC Coatings Inspector curriculum.

With the latest addition to its inspection series, SSPC has announced that coatings professionals who reach a certain level of certification can apply for special recognition via the new SSPC Master Coatings Inspector program.

To apply for the Master Coatings Inspector Program, individuals must hold current certification for any two steel inspection programs from SSPC (PCI, BCI, and NBPI) and for SSPC's concrete inspection program (CCI).

Requests for application should be directed to Terry Sowers at SSPC, 877-281-7772, ext. 2219; sowers@sspc.org.

gives special recognition to the parties involved in the work in four categories: aesthetic merit, commercial coating work, coating longevity, and difficult or complex industrial structures. This year's winners include the following and will be highlighted in an upcoming JPCL.

- William Johnson Award for aesthetic merit: Six Flags Scream Thrill Ride, owner, Six Flags Theme Parks; coating contractor, Baynum Painting; coating material supplier, PPG Protective & Marine Coatings
- Charles G. Munger Award for a structure demonstrating longevity of the coating (Two contestants tied.)
- Urbandale Water Works Fluted Column Elevated Water Tank: owner, Urbandale Water Works; painting contractor, J.R. Stelzer Company; coating material supplier; coating material supplier, Tnemec Company; and
- Hardy Avenue Elevated Water Tank: owner, the City of Nederland; coating contractors, Neuman Company (1982) and TMI Coatings (1999); coating material supplier, Sherwin-Williams
- E. Crone Knoy Award for excellence in coating a commercial structure: Arecibo Observatory; owner, National Astronomy and Ionosphere Center (NAIC) Cornell University and the National Science Foundation; coating contractor, Spensieri Painting, LLC; coating material supplier: PPG Protective & Marine Coatings
- George Campbell Award for completion of a difficult or complex project: Lovel Briere Fuel Oil Barge; owner, Harley Marine Group; Builder, Zidell Marine Group; Coating Contractor, HCI Industrial & Marine Coatings, Inc.; coating material suppliers, Jotun Paint and International Protective Coatings

Kudos for Good Writing

Awards for excellence in writing went to the following.

SSPC's Outstanding Publication Award: Hugh Roper, Raymond Weaver, and Joseph Brandon received the award for the article "Peak Performance from Abrasives," June 2006 *JPCL.*

The following authors received *JPCL* Editors' Awards.

- Randy Nixon, "Deterioration of Wastewater Treatment and Collection System Assets: Knowing Where and How to Look," October 2006 *JPCL*
- Jerry Arnold and Mitch Connor, "Maintenance Painting of Combined Cycle Natural Gas Power Plants," November 2006 *JPCL*
- Dr. Michael O'Donoghue, Ron Garrett, and Vijay Datta, "Straining at a Gnat and Swallowing a Camel: Health Performance Issues with Two-Part Polyurethane Finish Coats," December 2006 *JPCL*
- Robert Kogler, "Concrete Bridges: Heading Off the Impending Durability Burden," April 2007 *JPCL*

SSPC Individual Member Update

Below is the list of 54 new individual members who joined SSPC in January 2008.

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

- Douglas Agnes, Mechanicsville, MD
- Shane Anderson, Arvada, CO
- Mark Bement, Buffalo, NY
- Susan Benter, Berlin, WI
- Peter Brunson, Killen, AL
- Kim Carruthers, Moncton, NB, Canada
- John Carson, N. Charleston, SC
- Allen Cheek, Kingsport, TN
- James Colangelo, Sewell, NJ
- Robert Conn, Cameron, TX
- Joseph Dias, Santa Clarita, CA
- Ryan Felsenthal, New Prague, MN
- Martin Flach, Enon, OH
- David Frisina, Stanley, NC
- Kevin Gardiner, New Castle, DE
- Stephen Gaskill, Huntsville, AL
- Larry Gelner York, Haven, PA
- Matthew Gomez, Tulsa, OK
- Robert Goulet, Portsmouth, NH
- Michael Greenberg, Princeton, NJ
- Thomas Guzek, Wheeling, IL
- Kjell Haugland, Scunthorpe, N. Lines, UK
- Cliff Iftimie, Bridgeview, IL
- Monte Johnston, Cranbrook, BC, Canada
- Kenneth Kroll, Hollywood, FL
- Jason LaDow, Houston, TX
- Dan Larrington, Houston, TX
- Eric MacDonald, Napan, NB, Canada
- Mark Mallamo, Milford, DE
- Allan Marr, St. John, NB, Canada
- Thomas Matzke, Orlando, FL
- Juanita Miller, Sachse, TX
- Walter Morash, Dartmouth, NS, Canada
- Jon Ness, Alpine, CA
- Patrick Page, Ames, IA
- Jocelyn Peltier-Huntley, Colonsay, SK, Canada
- Jose Perez, San Diego, CA
- John Ragios Scaramanga, Chaidari, Greece
- Peter Ravazza, Oakland, CA
- Nathan Reindal, Prior Lake, MN
- William Schneider, Conroe, TX
- Patrick Schrock, Welland, ON, Canada
- Luc Seguin, Calgary, AB, Canada
- Gary Smith, Nashville, TN
- Glenn Smith, Merritt Island, FL
- Michael Spillane, Dallastown, PA
- Sarah Standlee, The Woodlands, TX
- Thomas Steenmeyer, Snohomish, WA
- Arnold Steinmetz, Marathon, FL
- David Todoroff, Cleveland, OH
- Sam Turner, Spring, TX
- Bryan Westrick, Bradenton, FL
- Kathryn Wiederhold, Oakland, CA
- Woo Saeng Yoon, Changwon, Gyungnam, Republic of Korea

SSPC Holds CCI Course during WOC

The PDCA Southern Nevada Chapter hosted a public offering of the Concrete Coating Inspector Program (CCI) January 18–23 in Henderson, Nevada, concurrent with the World of Concrete.

The instructors were Jerry Colahan and Glynn Loftin. Twelve students participated.

The PDCA Southern Nevada Chapter has hosted a CCI Course previously, also.

As is standard, the first four days of the program were devoted to classroom lectures about planning, substrate repair prior to surface preparation, surface preparation itself, coating surveys, specifications, and documentation requirements. Ample time was allotted for hands-on exercises and instrument practice. Lectures were supplemented by quizzes, group exercises, and case studies.

The intended audience for the course includes inspectors, applicators, contractor managers, specifying engineers, consultants, technical reps. and material and equipment suppliers.

For information about hosting or taking any of SSPC's training and certification courses, visit www.sspc.org or call 1-877-281-7772.

AIA Approves SSPC Architectural Sessions

SSPC: The Society for Protective Coatings is pleased to announce that the The American Institute of Architects (AIA) has approved the authorization of SSPC as a continuing education provider for the Society's architectural coatings sessions.

AIA awarded continuing education units (CEU) to professionals who attended the Architectural Coatings Sessions at its annual conference and exhibition—The Paint and Coatings EXPO—PACE 2008. Three sessions covered various aspects of architectural coatings, including preservation, aesthetics and performance; the latest in coatings technology for green building practices; and architectural coatings for concrete.

The AIA represents the professional interests of over 80,000 licensed architects, emerging professionals, and allied partners.

Low-Temperature Cure Coating Keeps Power On

By Lori R. Huffman, JPCL

Hydroelectric plants operate by converting the kinetic energy of water flowing downstream to electricity through the use of turbines and generators. Because the plants are usually located in rural areas and the hydroelectric generation process produces no emissions, the environment is relatively benign; however, the real maintenance challenge is protecting steel from abrasive immersion conditions, and in some cases, from cold weather.

In one project, completed in May 2005, a Canadian hydroelectric plant's nine-kilometer-long (5.6-mile) buried penstock, which included 5.7 km (3.5 miles) of steel pipe, required surface preparation and application of a coating on the interior. The owner decided to coat the interior of the penstock to protect it from microbiologically induced corrosion (MIC). The project was carried out during cold weather conditions, which can be a challenge to successful painting, says Dr. Mike O'Donoghue, director of engineering and technical services for ICI Devoe Coatings Canada.

Due to the environmental, economic, and logistical concerns involved with abrasive blasting, the contractor Mac & Mac Hydrodemolition used ultra-high pressure waterjetting at 40,000 psi (2,758 bar) to prepare the moderately pitted steel. The blasting water drained to the downstream end of the penstock, where it was pumped into a water truck. Every 1,000 ft (305 m), the washout material was shoveled out of the penstock through orifices along the conduit, the owner says. The owner required that a sediment pond be constructed for disposal of the washout material.

> **"The real challenge for maintaining hydroelectric plants is protecting steel from abrasive immersion conditions and, in some cases, from cold weather."**

A low temperature curing, 100% solids epoxy was chosen to protect the penstock. According to O'Donoghue, the epoxy adheres to low surface profiles, light to medium flash-rusted steel, mill scale, and damp as well as wet surfaces. The contractor sprayed on the coating and back rolled the first coat to fill pitting. A second coat of the epoxy followed, with both coats measuring six to eight mils (150 to 200 microns) thick. Applied at 40 F (4.4 C), the coating takes two to three days to set up, says O'Donoghue. The second coat is applied after washing the first coat to remove heavy amine film, says the contractor.

The project took 60 days from mobilization and water jetting and coating to demobilization, the contractor says. The coating has been in service for two and one-half years.

Access Success at Alamodome

By Daryl Fleming, JPCL Staff

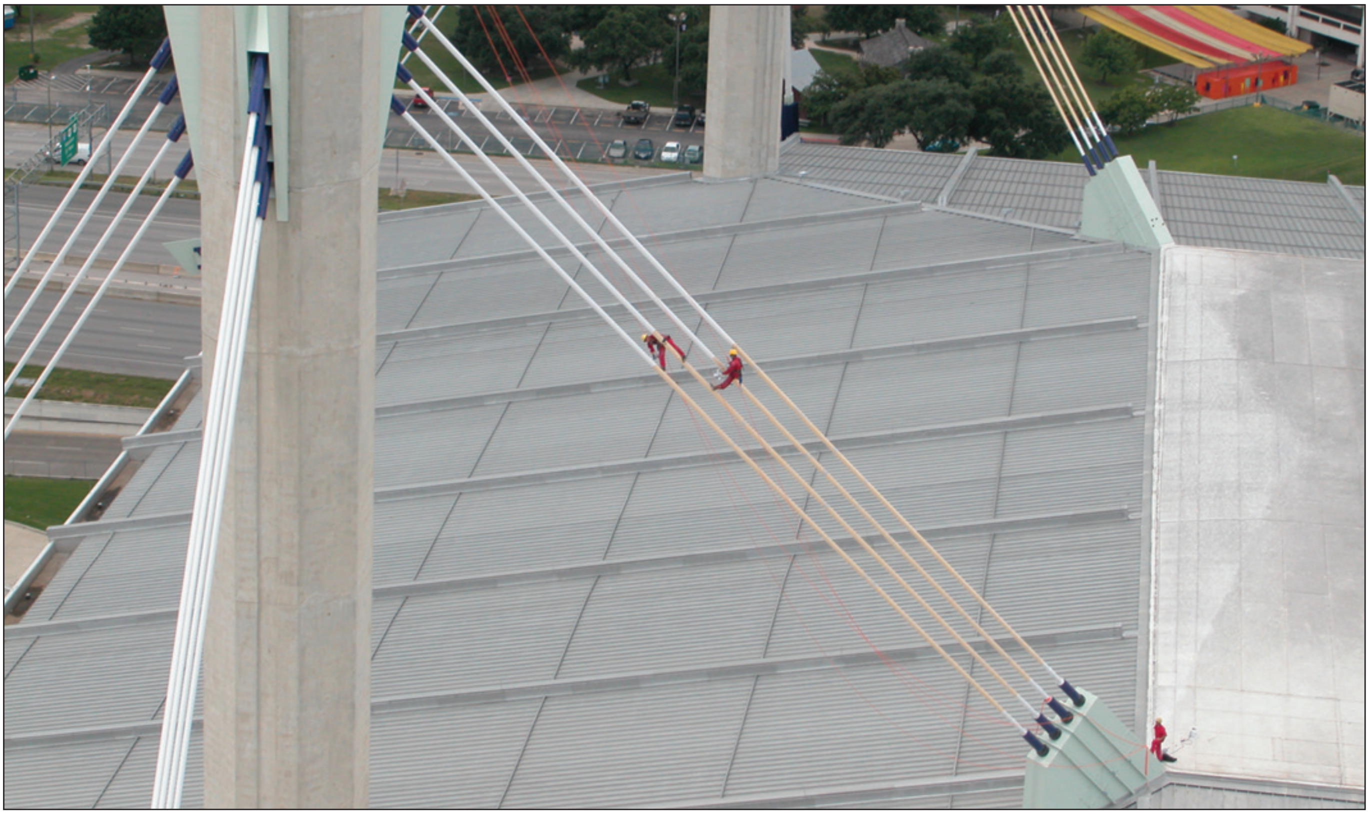
During a year-long maintenance painting project on San Antonio's Alamodome in 2007, the painting contractor needed a variety of technologies for accessing difficult to reach areas. Scaffolding, cranes, and a seemingly low-tech solution—rope access— kept the project on track.

A San Antonio-based painting contractor had painted a majority of the Alamodome, former home of the NBA's Spurs, with the help of aerial boom lifts, cranes, and scaffolding. But the "inner" cables that support the roof, that is, the cables that connect the roof to exterior 300-foot mast columns, could not be accessed for painting due to a variety of issues with the cranes being used, including difficulty maneuvering the cranes, getting the right "footing" for the cranes, and more generally, scheduling the use of the cranes.

According to Jesse Cantu III, project manager for the painting contractor, there weren't many equipment options available for accessing the upper reaches of the facility. Constructing the scaffolding necessary for painting the cable sheaths was an estimated 40-day job—not counting the coat-

Continued

Rope access workers paint cable sheaths. Photo by Jesse Cantu III, courtesy of MHT Access Services Inc.



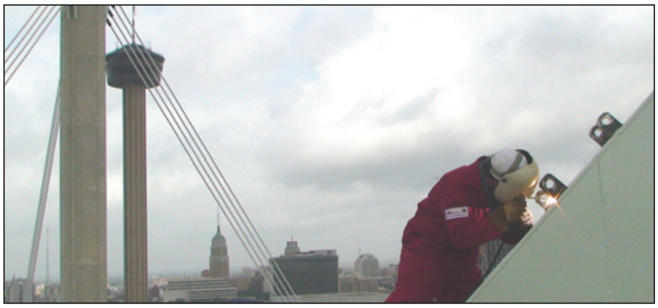
Rope access workers painting the "inner" cables at the Alamodome. The cables connect the roof to exterior 300-foot mast columns. Note the tie offs below, above, and on the workers. Photo by Howard Wall, Courtesy of MHT Access Services Inc.

ing work itself—and could have put the project over schedule.

With time pressure bearing down, Cantu contacted a Houston, TX-based rope access company that specializes in industrial inspection and maintenance painting. Rope access is a method of using ropes to achieve a safe work position at height or in areas of difficult access, without the use of scaffolding, cradles, or mobile elevated work platforms.

The access company deployed a four-man team to both prepare and coat the four cable sheaths for each of the four mast columns. Their work was completed in ten days, and no safety incidents were reported. According to Howard Wall, manager of the access company, because the company's workers are multidisciplined, the company can work cost-effectively and with fewer workers. Fewer workers, he adds, creates mimimal disruption to other operations and crews, as well as less exposure to risks.

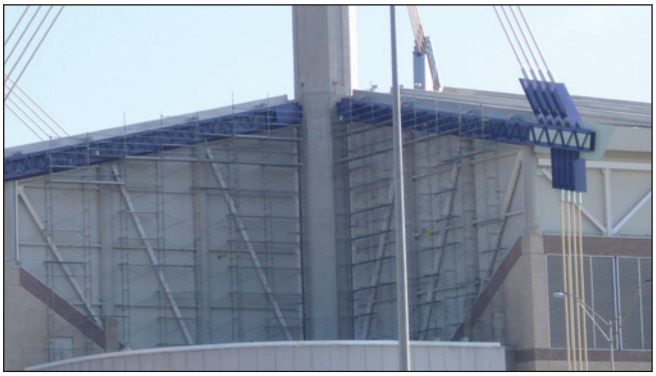
Given the nature of rope access work, safety is a high priority. At the Alamodome, the access team leader conducted daily safety meetings prior to the day's work, and the work team also met each evening for a safety review. According to Wall, his workers exceeded the required two tie-offs by maintaining three tie-offs at all times: two lines anchored from the top of the mast column that are also connected to the base of the cables where they join the roof; and one tie-off to the cable at the site of the painting work. The anchor points, or "pad eyes," were welded to the roof and allowed to remain after the completion of the rope access work, should they be needed for future access.



Welding the rope anchor points, or "pad eyes", to the Alamodome roof. Photo by Howard Wall, courtesy of MHT Access Services Inc.

Hand tools and power tools were used to prepare the cable sheath surfaces to SSPC-SP 2 and SP 3. All coatings were applied by brush and roller. An epoxy penetrating sealer was used to prime the cables for painting and was suitable for recoating on the day after its application, said Cantu. A high-solids urethane gloss enamel was applied as a finish coat; the coatings system's total dry film thickness was 2.5 to 3.5 mils.

Although it was windy and rainy for the last couple of days of the access firm's work, the company completed its tasks, with set backs caused by weather accounting for approxi-



Scaffolding erected to access eyebrow trusses. To the right is an outer cable. Courtesy of Paradise Painting, Inc.

mately one day only, said project manager Cantu.

In addition to painting the facility's "outer" cables (those cables connecting the mast columns to the ground surrounding the Alamodome), other work the painting contractor completed includes removing the existing coatings from the exterior I-beams, eyebrow trusses, and cable anchor fixtures. Scaffolding was used to access the eyebrow trusses; boom lifts were used to access the cable anchor fixtures at roof level; one-man swing stages were used to climb the mast columns to access the cable anchor fixtures at high altitudes; and 175 and 300 ton cranes with two-man baskets were used to paint the outer cable runs.

Two-man basket, suspended from crane, used to access upper cable runs from the mast column to the corners. Courtesy of Paradise Painting, Inc.

Notes Cantu, "Scaffolding and rope access both have their place in construction, but for something like this, rope access really blew it out of the water. When I look at a project that is somewhat tricky and delicate, I'll look at it a little differently, because I now know that I have options."

Paradise Painting, Inc. (San Antonio, TX) was the painting contractor. MHT Access Services (Houston, TX) provided rope access and painting of the inner cables.

Petzl (Crolles, France) manufactures the rope access gear used by MHT at the Alamodome. Keeler & Long, a subsidiary of PPG High Performance Coatings, manufactures the epoxy primer and the urethane gloss enamel finish coat.

Regulations

CARB Revises VOC Model Rule for AIM Coatings

The California Air Resources Board published its revised Suggested Control Measure (SCM), or model rule, for architectural and industrial (AIM) coatings on February 13, 2008. The SCM classifies AIM coatings into four categories: "Flat," "Nonflat," "Nonflat-High Gloss," and "Specialty." The specialty category includes industrial maintenance coatings, faux finishing coatings, fire-resistive coatings, and more than 30 others. The SCM was approved in late 2007.

A replacement to CARB's 2000 SCM, the revised document sets VOC levels for flat coatings, nonflat, and nonflat high-gloss coatings at 50, 100, and 150 g/L, respectively. However, for the specialty category, the agency has set most VOC limits above those of the other categories. For example, CARB set a VOC level of 250 g/L for industrial maintenance coatings, 340 g/L for zinc-rich primers, 350 g/L for faux finishing coatings, and 350 g/L for fire-resistive coatings.

The SCM is not a regulation. CARB develops SCMs to give California's 35 air quality control districts guidance to set their own regulations. Any of the air quality control districts can adopt or modify the SCM as needed to reduce smog. A CARB SCM goes into effect as a regulation only in districts that adopt or adapt it.

To read the entire rule and accompanying information, go to http://www.arb.ca.gov/coatings/arch/docs.htm.

OSHA Opens New Training Centers Nationwide

The Occupational Safety and Health Administration (OSHA) has announced the opening of eight new OSHA Training Institute (OTI) Education Centers and two renewals, continuing the expansion of OSHA-approved safety and health training nationwide.

The centers, which originated in 1992, offer training courses on OSHA standards and occupational safety and health issues to private-sector and non-OSHA federal personnel. More than 27,000 people were trained in fiscal year 2007.

Trainer courses are offered by topic areas, including construction, general industry, disaster site, and maritime. Through these train-the-trainer programs, qualified individuals who complete a one-week OSHA trainer course are authorized to teach 10-hour or 30-hour courses focusing on safety and health hazards.

Associations

Northwest Coatings Fest 2008 Set for May

The Pacific Northwest Society for Coatings and Technology, a constituent society of the Federation of Societies for Coatings Technology (FSCT), will hold its annual spring symposium, the Northwest Coatings Fest 2008, on May 7–9, 2008, at the

Continued

Regulations

CARB Revises VOC Model Rule for AIM Coatings

The California Air Resources Board published its revised Suggested Control Measure (SCM), or model rule, for architectural and industrial (AIM) coatings on February 13, 2008. The SCM classifies AIM coatings into four categories: "Flat," "Nonflat," "Nonflat-High Gloss," and "Specialty." The specialty category includes industrial maintenance coatings, faux finishing coatings, fire-resistive coatings, and more than 30 others. The SCM was approved in late 2007.

A replacement to CARB's 2000 SCM, the revised document sets VOC levels for flat coatings, nonflat, and nonflat high-gloss coatings at 50, 100, and 150 g/L, respectively. However, for the specialty category, the agency has set most VOC limits above those of the other categories. For example, CARB set a VOC level of 250 g/L for industrial maintenance coatings, 340 g/L for zinc-rich primers, 350 g/L for faux finishing coatings, and 350 g/L for fire-resistive coatings.

The SCM is not a regulation. CARB develops SCMs to give California's 35 air quality control districts guidance to set their own regulations. Any of the air quality control districts can adopt or modify the SCM as needed to reduce smog. A CARB SCM goes into effect as a regulation only in districts that adopt or adapt it.

To read the entire rule and accompanying information, go to http://www.arb.ca.gov/coatings/arch/docs.htm.

OSHA Opens New Training Centers Nationwide

The Occupational Safety and Health Administration (OSHA) has announced the opening of eight new OSHA Training Institute (OTI) Education Centers and two renewals, continuing the expansion of OSHA-approved safety and health training nationwide.

The centers, which originated in 1992, offer training courses on OSHA standards and occupational safety and health issues to private-sector and non-OSHA federal personnel. More than 27,000 people were trained in fiscal year 2007.

Trainer courses are offered by topic areas, including construction, general industry, disaster site, and maritime. Through these train-the-trainer programs, qualified individuals who complete a one-week OSHA trainer course are authorized to teach 10-hour or 30-hour courses focusing on safety and health hazards.

Associations

Northwest Coatings Fest 2008 Set for May

The Pacific Northwest Society for Coatings and Technology, a constituent society of the Federation of Societies for Coatings Technology (FSCT), will hold its annual spring symposium, the Northwest Coatings Fest 2008, on May 7–9, 2008, at the

Continued

Semiahmoo Resort in Blaine, WA. The technical program will focus on how maintenance coatings, industrial coatings, and architectural coatings will be controlled by today's educated consumer.

The keynote speaker for the conference lunch on Thursday, May 8, will be Randy Jahren, a lead engineer in Boeing Commercial Airplanes' Material and Process Technology (M&PT) Paints and Coatings Group.

For more symposium information, contact Jeff Davis at jdavis@ethorn.com or visit www.pnwsct.org. For hotel information and reservations, contact Semiahmoo Resort at www.semiahmoo.com.

ASTM Metallic Coatings Committee To Meet

ASTM International's Metallic and Inorganic Coatings Committee (B08) will meet on May 8, 2008, in Denver,CO, and on October 23 at ASTM headquarters in West Conshohocken, PA.

All interested individuals may attend ASTM meetings.

For more information about the upcoming meetings, call Diane Rehiel, ASTM International, 610-832-9717, drehiel@astm.org; or visit the committee web page at http://www.astm.org/commit/B08.htm.

Companies

Industrial Scientific Elects President and COO

Industrial Scientific Corporation has announced that Justin McElhattan was elected to the newly created position of president and chief operating officer, effective immediately. In his new role, Mr. McElhattan will be responsible for integrating and growing the corporation's worldwide gas monitoring business.


Justin McElhattan

Since joining Industrial Scientific in 1998, Mr. McElhattan has served in positions of increasing responsibility, including North America sales manager, general manager of service operations, director of global operations, vice president, operations, and, most recently, president, Industrial Scientific Americas.

Industrial Scientific Corporation designs, manufactures, sells, and services gas monitoring instruments, systems, and related products.

Tnemec Chooses Tanks of the Year

A pair of 500,000-gallon water tanks in Anderson, SC, that mimic two hot air

balloons, complete with gondola and passengers, have been chosen 2007 Tanks of the Year by the Tnemec Company, Inc. (Kansas City, MO), according to Doug Hansen, Tnemec director of sales, Water Tank Market.

"The City of Anderson, which hosts an annual hot air balloon festival, decided to honor the event by using two new water tanks as landmarks," Hansen noted. "The Anderson tanks were chosen from numerous nominations submitted by Tnemec representatives from across the United States. The winning entry impressed the judges with its visual impact and imaginative design, reflecting the community's support of its annual BalloonFest," Hansen said.

The balloon designs and logos were created by artist Deborah Bzdyl, president of Impact Graphics Inc.

Continued

Both tanks were fabricated by CB Constructors in Alpharetta, GA, where a protective two-component, zinc-rich primer was spray applied on interior and exterior steel.

The interior of the tank received two additional coats of a polyamide epoxy, which were spray applied in the field by Utility Service Company Inc., a contractor located in Madison, Wisconsin.

A combination of exterior polyurethane coatings was selected for their resistance to weathering and aesthetics.

Tnemec, established in 1921, specializes in industrial coatings for steel, concrete, and other substrates for new construction and maintenance.

Promotions at PPG

Aziz Giga

PPG Industries (Pittsburgh, PA) has named Aziz Giga, vice president, strategic planning, to the post of vice president, strategic planning and treasurer, and appointed Kim Edvardsson, director, global treasury, as assistant treasurer reporting to Giga.

Mr. Giga adds responsibility for global oversight of the corporate treasury department to his strategic planning leadership.

Mr. Giga joined PPG in 1977 as a planning analyst in the Pittsburgh chemicals. In 1997, he became director, strategic planning; he was elected vice president in 2000.

Ms. Edvardsson joined PPG in 2002 as director, financial analysis, in the corporate controller function and was named director, global treasury, in the corporate treasury function in 2005. Before joining PPG, she was manager, corporate reporting and financial policy, for CBS (formerly Westinghouse Electric Corporation).

PPG is a global supplier of paints, coatings, chemicals, optical products, specialty materials, glass and fiberglass. The company has manufacturing facilities and equity affiliates in more than 30 countries.

Emerald Performance Materials Acquires CVC Specialty Chemicals

Emerald Performance Materials, LLC, an affiliated portfolio company of Sun Capital Partners, Inc., announced it has acquired CVC Specialty Chemicals, Inc., a maker of specialty epoxies, monomers, and catalysts for structural composites, adhesives, coatings, and industrial applications. The product lines included in the sale are Epalloy™ Specialty Epoxy Resins, HyPox™ Elastomer Modified Epoxy Resins, Erisys™ Monomers and Modifiers, and Omicure® Catalysts and Accelerators. These product lines will continue to be manufactured at their current locations.

CVC's (Moorestown, NJ) products are used in high performance applications such as structural composites and adhesives for industrial and marine coatings; automotive and aerospace applications; and wind energy blades.

Emerald Performance Materials, LLC (Cuyahoga Falls, OH) is a manufacturer of chemical additives and polymers used in diverse consumer and industrial products.

Emerald Specialty Polymers, a division of Emerald Performance Materials, is a manufacturer of reactive liquid polymers, nitrile, and other specialty emulsions. It has manufacturing operations in Akron, OH.

Spider Hires Sales Reps for Chicago, Atlanta


Lee Tigner

Spider, a division of SafeWorks, LLC, has hired James Ferland as a district sales representative for its Chicago operation center and also has hired Lee Tigner as district sales representative for its Atlanta location.

In his new position in Atlanta, Lee Tigner is responsible for solving the suspended access and safety challenges of contractors and facility owners in Georgia and parts of Tennessee and Alabama. He will focus on driving new business from both commercial and industrial customers.

Mr. Tigner has over 10 years of experience in the building materials industry, including work at Boise Cascade Corporation, where he was responsible for residential and commercial building material lines. In his most recent role as an outside sales representative with PlyMart, he was responsible for all selling recommendations, job estimating, price negotiations and client procurement.

In his new position in Chicago, James Ferland will be responsible for solving contractors' suspended access and safety challenges in the Chicago area.

Mr. Ferland has held a variety of roles in Chicago's construction market, Spider says, including sales for Mittal Steel, and, most recently, as account manager with Hilti.

Spider, a division of SafeWorks, LLC, is a manufacturer and distributor of access and safety solutions.

Products

Sensor System Improves Detection of Lead, Heavy Metals

According to the Department of Energy's Pacific Northwest National Laboratory (PNNL; Richland, WA), it has developed a new rapid, portable, and inexpensive detection system that identifies personal exposures to toxic lead and other dangerous heavy metals. The device, which can analyze blood samples derived from a simple finger prick, is designed to detect lead and other toxic metals in urine and saliva as well.

Results are as reliable as those of current state-of-the-art mass spectrometry systems many times its size, PNNL says.

This new system is intended for monitoring toxic metal exposures in high-risk populations, such as industrial workers, children, and people living in polluted areas.

A bit larger than a lunchbox, the new detection system is field-deployable,

Continued

Erisys™ Monomers and Modifiers, and Omicure® Catalysts and Accelerators. These product lines will continue to be manufactured at their current locations.

CVC's (Moorestown, NJ) products are used in high performance applications such as structural composites and adhesives for industrial and marine coatings; automotive and aerospace applications; and wind energy blades.

Emerald Performance Materials, LLC (Cuyahoga Falls, OH) is a manufacturer of chemical additives and polymers used in diverse consumer and industrial products.

Emerald Specialty Polymers, a division of Emerald Performance Materials, is a manufacturer of reactive liquid polymers, nitrile, and other specialty emulsions. It has manufacturing operations in Akron, OH.

Spider Hires Sales Reps for Chicago, Atlanta

Spider, a division of SafeWorks, LLC, has hired James Ferland as a district sales representative for its Chicago operation center and also has hired Lee Tigner as district sales representative for its Atlanta location.

Lee Tigner

In his new position in Atlanta, Lee Tigner is responsible for solving the suspended access and safety challenges of contractors and facility owners in Georgia and parts of Tennessee and Alabama. He will focus on driving new business from both commercial and industrial customers.

Mr. Tigner has over 10 years of experience in the building materials industry, including work at Boise Cascade Corporation, where he was responsible for residential and commercial building material lines. In his most recent role as an outside sales representative with PlyMart, he was responsible for all selling recommendations, job estimating, price negotiations and client procurement.

In his new position in Chicago, James Ferland will be responsible for solving contractors' suspended access and safety challenges in the Chicago area.

Mr. Ferland has held a variety of roles in Chicago's construction market, Spider says, including sales for Mittal Steel, and, most recently, as account manager with Hilti.

Spider, a division of SafeWorks, LLC, is a manufacturer and distributor of access and safety solutions.

Products

Sensor System Improves Detection of Lead, Heavy Metals

According to the Department of Energy's Pacific Northwest National Laboratory (PNNL; Richland, WA), it has developed a new rapid, portable, and inexpensive detection system that identifies personal exposures to toxic lead and other dangerous heavy metals. The device, which can analyze blood samples derived from a simple finger prick, is designed to detect lead and other toxic metals in urine and saliva as well.

Results are as reliable as those of current state-of-the-art mass spectrometry systems many times its size, PNNL says.

This new system is intended for monitoring toxic metal exposures in high-risk populations, such as industrial workers, children, and people living in polluted areas.

A bit larger than a lunchbox, the new detection system is field-deployable,

Continued

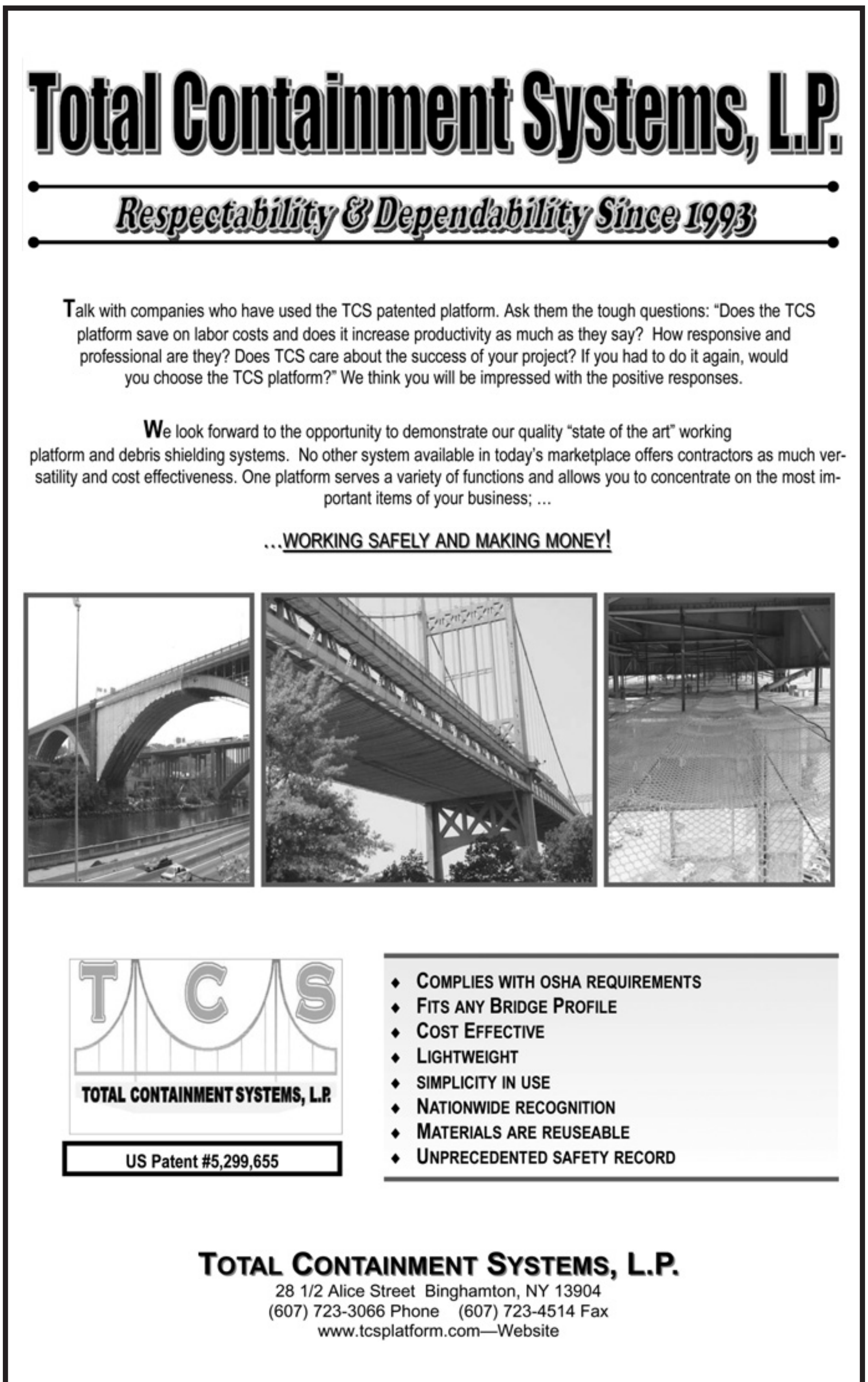
with plug-and-play features that allow different sensors to be exchanged to detect a variety of heavy metal toxins. The entire system, which is battery-operated and requires about one and one-half times the power of a typical laptop computer, delivers measurements within a two-to-five minute analysis period, according to PNNL.

The device can use two classes of sensors for detecting lead and other heavy metals. The first is based on a flow injection system using a mercury-film electrode to analyze metals in blood, urine, or saliva samples.

To eliminate the use of toxic mercury in conducting the analysis, the second class of the sensor uses a mercury-free approach of nanostructure materials developed at PNNL. This involves use of either self-assembled monolayers on mesoporous supports—SAMMS™ technology—or functionalized magnetic nanoparticles that provide detection sensitivity at a parts-per-billion level.

Battelle, which operates PNNL for DOE, filed a patent application in December 2007 for the improved sensor technology used in this next-generation biomonitoring device. Battelle is seeking commercialization partners and welcomes companies interested in the technology to contact its commercialization manager Bruce Harrer—email: bruce.harrer@pnl.gov.

For more information about the product, contact Geoffrey Harvey—tel: 509-372-6083; email: Geoffrey.Harvey@pnl.com.



Corrosion-Resistant Paint for Galvanized Steel

Greenstone Holdings Inc. introduced to the U.S. market a corrosion-resistant paint, Permeate™ HS-200, developed and manufactured by D&D Corporation of Japan. Greenstone, based in New York, said it is the exclusive U.S. agent for the product, described as an inorganic silicate sealer paint that enhances corrosion resistance on metal surfaces such as galvanized steel. The product is offered in a range of colors, and is reported to posses a high degree of UV resistance and resistance to graffiti and dirt.

Recommended applications include bridges, power lines, towers, pipelines, fuel and gas tanks, offshore oil rigs, and other structures where protection of metal is important.

For more information about the product, visit www.egreenstone.com.

Waterjet Intensifier Pump for Remote, Mobile Locations

Jet Edge, Inc. (St. Michael, MN), has introduced its iP55-280DS diesel-powered waterjet intensifier pump, which is described as ideal for use in remote and

mobile locations where electricity is scarce.

The iP55-280DS is powered by a reliable 280hp Cummins turbo diesel engine that, according to the company, meets domestic and international Tier 3 emissions standards. It is designed to produce a flow rate of up to 4.1 gallons (15.5 liters) per minute of 55,000 psi (3,000 bar) ultra-high-pressure water for waterjet cutting, surface preparation, and cleaning applications.

The iP55-280DS uses a pressure-compensated hydraulic system to drive dual plunger-style intensifiers. The use of hydraulic fluid power provides smooth flowing UHP water resulting in long system life, the company says. Reliable and precise control of the electronically shifted intensifiers ensures superior performance standards with reduced operating costs, the company adds. The pump is built on a skid-mounted frame with lifting eyes and forklift guides provided for increased mobility.

For more information, contact Nancy Lauseng, marketing manager—tel: 763-497-8726; email: nancyl@jetedge.com.

Speedcove Has New, Exclusive Supplier

Solid Rock Enterprises, the original creator, manufacturer, and supplier of its new 2nd Generation SpeedCove Precast Cove Base Systems, is now the exclusive North American supplier to its growing network of distributors. The change became effective November 2007. For sales, technical, and distribution information, call 530-344-9000.

Rainbow, Inc. Awarded Lift Bridge Rehabilitation

Courtesy of the City of Duluth

Photo courtesy of Alfred Essa

Rainbow, Inc. (Minneapolis, MN) was awarded a contract of $2,019,230 by the City of Duluth, MN to perform coatings application and general rehabilitation services on the Duluth Aerial Lift Bridge, an historic 386-foot-long vertical lift bridge. The project includes recoating the vertical lift span and towers. The steel will be abrasive blast-cleaned to a Near White finish (SSPC-SP 10) and coated with an organic zinc-rich primer, an epoxy intermediate, and a urethane finish according to MN DOT Standard Specifications. The contract includes erecting full containment to control the emission of the existing lead-based coatings.

VHP Secures Arkansas River Bridge Painting Project

V.H.P. Enterprises, Inc. (Tarpon Springs) was awarded a contract by the Arkansas Highway and Transportation Department to recoat existing metal surfaces on a 3,043-foot-long by 57-foot-wide composite steel plate girder bridge over the Arkansas River. Approximately 3,556 tons of structural steel and 107 tons of 30-inch-diameter waterline will be coated with an inorganic zinc primer, an epoxy intermediate, and a polyurethane finish. The existing coatings contain lead; containment according to SSPC-Guide 6 is required. The contract, which required SSPC-QP 1 and QP 2 certifications, is valued at $2,780,000.

Phoenix Tank Services Wins Mixing System Project

Phoenix Tank Services, a Division of Phoenix Fabricators & Erectors, Inc. (Avon, IN) was awarded a contract of $316,000 by the Greenwood Commissioners of Public Works (Greenwood, SC) to install new mixing systems in an existing 1 MG elevated tank and two existing 0.5 MG elevated tanks. The project includes applying an epoxy coating system to the new mixing system components and interior tank surfaces impacted by the retrofits.

Courtesy of Phoenix Tank Services

J&W to Recoat 4.5 MG Reservoir

Courtesy of the City of Lynchburg

J&W of North Carolina, Inc. (Vanceboro, NC) was awarded a contract of $618,000 by the City of Lynchburg, VA to perform coatings application and repairs on an existing 4.5 MG water storage reservoir. The contract, which required SSPC-QP 2 certification, includes recoating the interior wet surfaces, exterior surfaces, and pit piping of the 110-foot-diameter by 63-foot-high steel tank. The exterior surfaces are currently coated with an aluminum alkyd system with up to 33% lead by weight, necessitating containment according to SSPC-Guide 6 and waste disposal according to SSPC-Guide 7. The exterior will be abrasive blast-cleaned to a Commercial finish (SSPC-SP 6) using coal slag with a lead-stabilizing abrasive additive and refinished with a four-coat epoxy-urethane system. The interior wet surfaces will be abrasive blast-cleaned to a Near White finish (SSPC-SP 10) and lined with a three-coat epoxy system. The contract requires solid desiccant dehumidification to facilitate proper curing. The pit piping will be abrasive blast-cleaned to a Commercial finish and coated with a two-coat epoxy system.

Ostrom Wins Dam Powerplant Painting Project

Courtesy of US Bureau of Reclamation

Ostrom Painting & Sandblasting, Inc. (Rock Island, IL) was awarded a contract of $319,990 by the United States Bureau of Reclamation (Great Plains Region) to perform surface preparation and coatings application at Yellowtail Dam and Powerplant, a 525-foot-high by 1,480-foot-crest length concrete arch dam on the Bighorn River.

The project includes cleaning and recoating the interior and exterior surfaces of 84-inch-diameter hollow jet valves, the downstream face of ring follower gates, the interior surfaces of 84-

inch-diameter penstocks, the exterior surfaces of the non-concrete-embedded sections of 84-inch-diameter penstocks, the exterior surfaces of 84-inch-diameter hollow jet valve supports, and the exterior surfaces of flushing piping and valves. The existing coatings contain lead, chromium, cobalt, manganese, nickel, vanadium, and zinc.

Arizona Coating Applicators Wins Tank Painting Project

Arizona Coating Applicators, Inc. (Phoenix, AZ) was awarded a contract of $275,929.20 by the City of Tolleson, AZ to reline the interior surfaces of two existing 1 MG water storage tanks and to perform related repairs. The interior surfaces of the 104-foot-diameter by 16-foot-high steel tanks will be abrasive blast-cleaned to a Near White finish (SSPC-SP 10) and lined with a two-coat epoxy system.

Quick Hits

Vista Paint Corporation (Fullerton, CA) was awarded a contract of $2,107.56 by Los Angeles County, CA to supply twenty-six five-gallon kits of 100%-solids coating for roller application on 2,600 square feet of stainless steel cooling tower basin surfaces.

United Painting, Inc. (Piedmont, SC) was awarded a contract of $5,900 by Aiken County, SC to abrasive blast-clean and recoat approximately 3,000 square feet of aerated sewage pump surfaces, including four pumps, motors, discharge valves, and piping.

KTA-Tator, Inc. (Pittsburgh, PA) was awarded a contract by the City of Savannah, GA to provide coatings inspection services for the interior and exterior painting of an existing 200,000-gallon tank and an existing 100,000-gallon tank.

Amairitek Services (Peyton, CO) was awarded a contract of $37,900 by Colorado Springs Utilities to line the interior surfaces of an existing 16-foot-diameter by 10-foot-high condensate storage tank at the 142 MW Martin Drake Power Plant Unit 7.

Mid Valley Metal Works, LLC (Salem, OR) was awarded a contract of $15,976 by the Tri-County Metropolitan Transportation District (Portland, OR) to abrasive blast-clean and powder coat existing 53.25-inch-long by 36-inch-wide by 7-inch-deep stainless steel bus lift platforms under a 1-year term agreement.