Capping 2023 with a Full Crop of Coatings Industry Events

As we find ourselves officially heading into the second half of the year, JPCL has compiled a list of the remaining 2023 conferences and other protective coatings industry events. Highlighted by the popular TPC Connect: Industrial Coatings hosted buyer event in November, the calendar also includes two Department of Defense-hosted symposiums, as well as conventions covering the water, marine and surface preparation sectors.

For more event listings, visit paintsquare.com/events.

2023 DoD Corrosion Prevention Technology and Innovation Symposium (Administered by AMPP)
El Conquistador Resort, Tucson, Arizona
Aug. 14–17 | dodcorrcon.org

WEFTEC 2023 (Water Environment Federation)
McCormick Place, Chicago
Sept. 30–Oct. 4 | weftec.org

Western Coatings Symposium & Show
Paris Las Vegas Hotel & Convention Center, Las Vegas
Oct. 15–18 | westerncoatings.org

WaterJet Technology Association (WJTA) Conference & Expo
Ernest N. Morial Convention Center, New Orleans
Oct. 30–Nov. 1 | wjtaexpo.com

TPC Connect: Industrial Coatings
Westin Lake Las Vegas Resort & Spa, Henderson, Nevada
Nov. 6–9 | tpc-connect.com/ic

International WorkBoat Show
Ernest N. Morial Convention Center, New Orleans
Nov. 29–Dec. 1 | workboatshow.com

DoD Maintenance Symposium
San Diego Convention Center, San Diego
Dec. 18–21 | sae.org/attend/dod

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FEATURES

10 Coatings 101, Beyond Blasting: Intro to Hand & Power Tool Cleaning Basics

While abrasive blast-cleaning is the most effective method of surface preparation, it is not always a feasible option, especially when dimensions and/or economics of the job factor in. This Coatings 101 column—an updated compilation of previously published JPCL articles—describes how hand and power tools can be employed to remove coatings and corrosion to prepare a surface for new coatings.

16 Taking the Shock out of Electric Vehicle Battery Production Facilities

BY CASEY BALL, SHERWIN-WILLIAMS HIGH PERFORMANCE FLOORING; AND EUGENE GEISZ, SHERWIN-WILLIAMS PROTECTIVE & MARINE

With billions invested in electric vehicle battery facilities, in which a small electrostatic discharge could take out computers and production equipment or cause explosions, it's critical to get resinous electrostatic dissipative (ESD) flooring systems specified and installed correctly. This article will explain why electrostatic charges occur in the first place and how to mitigate them in critical areas using ESD flooring.

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COVERAGE

CURRENT EVENTS, CONVERSATION, CALENDAR UPDATES AND MORE FROM THE PEOPLE AT PAINTSQUARE.COM



NTSB Requests Weathering Steel Bridge Action

On May 18, the National Transportation Safety Board (NTSB) announced new recommended actions for bridge maintenance, following the ongoing investigation of the 2022 Fern Hollow Bridge collapse in Pittsburgh. The recommendations call for federal and state authorities to review inspection reports and to identify incomplete follow-up actions that need to be resolved for bridges made of uncoated weathering steel.

Uncoated weathering steel requires periods of dryness for a protective oxide coating to form. This coating, or patina, usually resists corrosion. Investigators report that they have found evidence of corrosion, deterioration and section loss on all four of the Fern Hollow Bridge's legs as a result of water and debris accumulation. Debris, dirt and leaves were all reportedly blocking the bridge's drainage systems, resulting in water flowing to the wrong areas and preventing a protective patina from forming.



PHOTO: TRAVELVIEW / GETTY IMAGES

Investigators have also stated that past inspections on the bridge, performed by the Pennsylvania Department of Transportation, identified issues with drainage but failed to perform regular maintenance.

Consequently, the NTSB has asked the Federal Highway Administration "to develop a process for bridge owners nationwide to perform necessary follow-up actions on bridges with uncoated weathering steel components."

Along with the early recommendation, the NTSB also released new documents with photos and 3D-laser scans of the deterioration of all four bridge legs.

"Safe, reliable infrastructure is a top priority of the (Gov. Josh) Shapiro administration, and we are committed to ensuring Pennsylvanians and all motorists can travel across the Commonwealth safely," PennDOT Spokeswoman Alexis Campbell said in an interview.

"To that end, PennDOT remains proactive in its review, analysis and maintenance of its bridges."

The Fern Hollow Bridge collapsed the morning of Jan. 28, 2022, and NTSB investigations into the cause of the collapse immediately followed. In December of last year, officials opened the new Fern Hollow Bridge, after the construction of the replacement structure was completed less than a year after the original bridge's collapse.

READER COMMENTS

"Road salt, a fairly moist environment and blocked drains are a bad combination for weathering steel."

—Tom Schwerdt

"All weathering steel beam ends and outside fascia beams should be painted. There is no expansion joint that doesn't eventually leak over the beam ends."

—Cameron Jewell

"A spring pressure washing to neutralize deicing salts and to remove dirt deposits is a great idea for all bridges painted or not."

—Mike Beitzel

"Any film forming coating system on beam ends will not do the job of protective coatings. Soluble salt remover and ion specific testing are essential for remediation of the non-visible contaminants required for proper surface prep that will assure the necessary intimate bonding connection of the protective coating system. I have seen too many "beam end paint jobs" with rust popping through and dripping connections even though they use the brown paint to possibly camouflage failures there. Given we are speaking often of structure critical connections, I know of only one system that chemically stops crevice corrosion that does not wrongly cover up active corrosion cells."

—Regis Doucette



Coating, Corrosion Led to AZ Pipeline Explosion

According to an investigation report from the National Transportation Safety Board, a fatal natural gas pipeline explosion in Arizona from 2021 resulted from tented tape wrap, leading to stress corrosion cracking. The NTSB also found during its investigation that owner and operator Kinder Morgan, Inc., did not record the correct coating type used for the segment of the pipeline, which led to a risk assessment that did not identify the cracking or corrosion.

On August 15, 2021, just before 5:30 a.m., a 30-inch-diameter natural gas transmission pipeline ruptured in Coolidge, Arizona. According to the NTSB, the rupture resulted in the release of natural gas vapor that ignited and exploded, causing a blast wave and gas-fed fire.

The incident reportedly destroyed a farmhouse about 451 feet away, killing two occupants and seriously injuring a third. Additionally, about 33 acres of vegetation were damaged in some areas about 878 feet away from the rupture crater.

A 47-foot segment of pipe was also ejected about 133 feet from the center of the crater. Kinder Morgan estimated property damage and emergency response costs to be $5,541,740.

The Arizona Republic reported that the company said it has replaced the ruptured pipe with new pipe, conducted multiple pipeline integrity tests, revised and enhanced its risk models for stress corrosion cracking and taken other actions.

The pipeline was originally installed in 1986 by All-American Pipeline Co. to carry crude oil from west to east. It was converted to natural gas transmission in 2002 and 2003, also altering the flow from east to west. Kinder Morgan took the pipeline over in 2012.

Data from Pipeline Examination Reports listed the coating type for the pipeline segment was listed as fusion-bonded epoxy. These were integrated into a Pipeline Open Database Standard (PODS), or Kinder Morgan's internal data management tool to identify and document pipeline specifications.

The NTSB reports that one pipeline data report, submitted in 2011 after a composite sleeve was installed on Line 2000 approximately 375 feet from the rupture location, noted that the coating type listed as fusion-bonded epoxy was incorrect at that location and that the actual coating type was spiral wrap tape. However, this was not recorded in the PODS.

At the time of the rupture, Kinder Morgan reportedly used a risk assessment to evaluate the pipeline segment for threats. The risk assessment algorithm determined the probability of failure from stress corrosion cracking near neutral and high pH SCC, the two types of SCC defined in ASME B31.8S.

PHOTO: COOLIDGE FIRE DEPARTMENT / NTSB

This was also further calculated using several correlating factors recording in PODS, including:

- Pipe age;
- Year of installation;
- Pipe manufacturer and mill location;
- Pipe diameter and wall thickness;
- Downstream distance from a compressor station;
- Location of pipe (above or below ground);
- Soil conditions (susceptibility, pH, and resistivity); and
- Coating type.

Before the rupture, the coating type of the ruptured pipeline segment was incorrectly listed in PODS as fusion-bonded epoxy. However, the coating type was spiral wrap tape. As a result, Kinder Morgan did not identify threats of SCC on the ruptured pipeline segment.

The investigation found that cracks leading to the rupture formed and coalesced on the outside of the pipe near a seam weld. The board noted that spiral wrap tape is more vulnerable to the type of corrosion that damaged the pipe compared to fusion-bonded epoxy or a powder coating.

"The National Transportation Safety Board determines that the probable cause of the August 15, 2021, pipeline rupture in Coolidge, Arizona, was tented tape wrap leading to stress corrosion cracking, a fracture at a longitudinal seam weld, and subsequent rupture of the pipe," wrote the NTSB in its report.

"Contributing to the rupture was Kinder Morgan's failure to record the correct coating type used for this segment of pipeline, leading to a risk assessment that did not fully identify the risk of stress corrosion cracking."

Harsco Changes Name to Enviri

The Harsco Corporation, a global supplier of environmental solutions and products, has announced that it will be changing its name to Enviri Corporation. The change is reportedly immediate, with Enviri also trading under the New York Stock Exchange ticker "NVRI," as of June 19. Enviri states that their new name and brand identity will better reflect the company's transformation over the past four years "into a single-thesis environmental solutions company," providing services for managing, recycling and beneficially reusing waste byproduct materials.

According to the release, the new name better aligns with the corporation's sustainability goals and recent achievements, including results from its latest Environmental Social and Governance Report, which include:

- 100% of revenue came from environmentally focused segments, compared to 67% five years ago;
- The company recycled, repurposed or reused more than 28 billion pounds of waste;
- The company's Clean Earth segment successfully recycled over 93% of all waste processed, totaling more than 8 billion pounds;
- The company saw a 70% increase, over a two-year span, in the number of new environmental solutions launched; and
- The company avoided more than 17 million metric tons of carbon emissions by its Harsco Environmental division between 2019 and 2021, on track to achieve its 2025 goal of avoiding 25 million metric tons of CO_2.

> "As we considered where we are today, how our business has evolved and our commitment to the environment, it is important to have a name and brand identity that align with this image."

"As we considered where we are today, how our business has evolved and our commitment to the environment, it is important to have a name and brand identity that align with this image," said Nick Grasberger, Chairman and Chief Executive Officer, Enviri Corporation.

"We are energized as we enter into this new era and look forward to continuing to operate with the same commitment to excellence that has been part of the Company's legacy for more than 170 years, while providing value for our investors, customers, partners and the communities in which we operate."

Though the company has changed its name to Enviri, Harsco Environmental, Clean Earth and Harsco Rail will all reportedly operate under the same names, but as divisions of Enviri.

Boeing Begins New Coatings Facility Construction



PHOTO: BOEING

Multinational aerospace company Boeing has recently begun construction on a new advanced coatings center in St. Louis, which will reportedly help support post-assembly phases of future military aircraft production. The new Advanced Coatings Center will reportedly be the third new facility that is part of Boeing's Phantom Works segment's "Production System of the Future Program." The new 47,500 square foot facility will reportedly begin operations in 2025. Phantom Works is a division of Boeing focused on research, development and prototyping.

"As we pivot toward future programs, Boeing's defense business is in the midst of one of the most significant investments in new facilities in our history," said Steve Nordlund, Boeing Air Dominance vice president, general manager and St. Louis senior site executive.

"This investment is not only to win new future franchise programs but, more importantly, to enable the United States to outpace increasingly capable and aggressive adversaries. We are revolutionizing how aircraft are designed, built and delivered because the threats demand it."

The program will reportedly allow Boeing to scale a "platform-agnostic, modular and flexible digital production system," for use in future defense programs.

Boeing has also reportedly opened a Lab and Test Facility in St. Louis and plans to open additional facilities in the coming years. Last fall, Boeing also opened a new purpose-built Advanced Composite Fabrication Center in Mesa, Arizona.

"With more than 15,000 employees, Boeing is Missouri's largest manufacturer that helps spur this state's economic growth every day. This new facility shows our commitment to growth and our investment in the talented workforce," said Missouri Governor Mike Parson.

This development comes after Boeing outlined paint peeling issues on its 787 Dreamliner jetliners, asking United States regulators to approve its plan for a potential fix, in November of last year. In a petition for

exemption to the Federal Aviation Administration, Boeing explained that the paint peeling occurs on the upper and lower surfaces of the wing and horizontal stabilizer due to exposure to ultraviolet radiation.

Prior to its request, Boeing would use speed tape over affected areas. According to reports, this short-term fix led some passengers to post photos online of 787 wings with tape and raise concerns.

"Even though the use of speed tape has no effect on the safety of the airplane, the public could perceive an unsafe condition when seeing tape on the wing surfaces," Boeing wrote to the FAA in a regulatory filing.

Because of this, Boeing has requested that the FAA to approve its plan to incorporate a layer of UV-blocking black topcoat between the primer and the white topcoat, as well as increasing the total allowed exterior finish thickness.

The proposed fix would affect fuel tank lighting protection and, since black color has an increased absorptivity of UV radiation relative to the existing paint scheme, impact fuel tank lightning ignition prevention.

Additionally, Boeing said that the "petition will address a fleet significant maintenance issue that is creating a public perception of an unsafe condition as well as creating the potential for significant airplane downtime" and that "paint peeling issue requires the operators to repaint the wing and horizontal stabilizer at a much higher frequency."

Repainting for UV damage also reportedly requires removal of the UV damaged material by sanding, increasing the risk of collateral copper foil and CFRP damage and subsequent repair, further increasing the cost and downtime of the more frequent repainting.

When performing maintenance painting of tank coatings, what are the pros and cons of overcoating an existing lining that appears to be in good condition?

IVARS J, BRAND ENERGY:
"Pros: Time and material savings. Cons: Compatibility issues, actual integrity of existing lining, overall adhesion, hidden undercut corrosion and more."

LYDIA FRENZEL, ADVISORY COUNCIL:
"In the late 1990s, the idea was to retain the 'good' paint and remove the 'bad' or 'dead' paint with spot repair. Waterjetting was used to remove the top coat or to provide a profile on the existing coating that had good adhesion and cohesion properties. This overcoating worked well and was economically viable, but there were failures because the primer or the undercoat had lost its elasticity or plasticizer. The new overcoat worked, but the undercoat would fail from adhesion, or the chemicals in the overcoat would attack the retained undercoat. The chemistry of the older coal-tar formulations had reached its lifetime."

The trend in bridge repainting projects is that they are routinely including structural repairs; however, the sequencing of the work on these projects is important. When should structural repairs be conducted: before, during or after the cleaning and repainting operations?

JOHN GRESH, CONTRACT PAINTING SERVICES LLC:
"During. Maintenance and protection of traffic, rigging, and containment collection and disposal costs can be major components of the total cost. Also, much of the repair will be exposed during blast-cleaning."

ALAN LUEDERS, DIRECT CONSULTATION:
"Before."

MIKE BEITZEL, MODJESKI AND MASTERS:
"This is a complicated issue. Ideally, and when possible, structural repairs should be conducted before overall cleaning and painting operations. However, field spot cleaning and priming will need to be performed at the structural repair locations. New repair material should be shop cleaned and primed. This method requires that all repair locations must be known and fully detailed in advance of cleaning and painting and that containment of these areas in some manner will be required that may negatively impact productivity and costs.

The major problem with overall cleaning and painting of the structure prior to making structural repairs is the time delay between cleaning and priming and the completion of structural repairs. The primed surfaces within and outside the structural repair area are likely to become mechanically damaged and or contaminated from construction operations such as drilling, fastener removal or installation and concrete pouring or welding or cutting operations. Prime coating will also likely be degraded by weathering and will become chalked and dirty requiring pressure washing. This method also jeopardizes and puts at risk the acceptable performance of the entire coating system."



BEYOND BLASTING

An Intro to Hand and Power Tool Cleaning Basics

Surface preparation is the most important factor in a successful protective coating application. While abrasive blast-cleaning is the most effective method of surface preparation, it is not always a feasible option, especially when dimensions and/or economics of the job factor in. This article will describe how hand and power tools can be employed to remove coatings and corrosion to prepare a surface for new coatings.

EDITOR'S NOTE: This section is excerpted from an article written in 1989 by Craig Henry (with Service Painting Company of Texas at the time) and Burke Bennett (with Clemtex at the time) and published in the February 1989 JPCL as part of the original Applicator Training Bulletin Series developed by the Coating Society of the Houston Area. The article was subsequently updated in 2006 and 2013, and updated again for publication this month.

Hand Tool Cleaning

Hand tool cleaning is one of the oldest methods of preparing steel surfaces. It is widely used for preparing small areas and for areas that cannot be abrasive blast-cleaned. A hand tool-cleaned surface is one that is free of loose rust, paint and mill scale. Tight rust, mill scale and paint are allowed to remain on the surface.

Common tools used for hand tool cleaning are sandpaper, non-woven abrasive pads, wire brushes, chipping hammers, scrapers, and hammers and chisels. The type of equipment selected depends on the condition and location of the surface. A chipping hammer or hammer and chisel are used in areas of heavy rust

PHOTO: MUIKRATHOK / GETTY IMAGES

scale, deep rust pits, or thick build-up of paint. Various types and styles of chisels are available for use, depending on the surface to be cleaned.

There are many types of wire brushes. Within each type, brushes are classified by wire stiffness and the size, number and rows of wire. The following are a few types of wire brushes.

- **Shoe handle scratch:** all-purpose wire scratch brush for brushing pipe threads and removing paint and rust scale
- **Wire scratch and scraper:** for removing loose, scaling paint and varnish
- **Hand wire scraper:** curved wire face for removing paint, varnish, and wax from large flat surfaces (The curved face enables better brushing control because fewer wires are in contact with the surface at one time.)
- **Flat block wire scratch:** longer and more flexible wires to remove paint, rust, and grease from large, flat surfaces
- **Sandpaper and non-woven pads** are used to remove loose paint and rust and to achieve a feathered edge on well-bonded paint, allowing touch-up paint to be applied consistently.

WHEN TO USE HAND TOOL CLEANING

A coating on a metal surface that has been abrasive blast-cleaned to White Metal or Near-White Metal generally is expected to last much longer than a coating on a surface that has been prepared by hand tool cleaning. Therefore, considerations of coating life expectancy should be determined before a job is specified.

Hand tool cleaning can provide an important alternative to other means of surface preparation in a maintenance-painting program. As areas of corrosion failure occur on a structure, hand tools are used to remove rust and failing paint selectively so that only the areas affected are prepared. In this instance, hand tool cleaning can be accomplished quickly and inexpensively to maintain the life of a coating system. Other benefits of hand tool cleaning are that it can be done in confined areas and that it produces a very small amount of dust. Therefore, hand tool cleaning may be appropriate near sensitive equipment or in areas where people are working.

For small areas, it is often less expensive per square foot to use hand tools, but on larger jobs, hand tool cleaning becomes very slow and labor intensive compared with other means of surface preparation.

The most proven coating for a hand tool-cleaned surface is a slow drying, oil-based paint. This type of paint will provide for good coverage over uneven surfaces and will adhere adequately. This is important when applying paint on a failed area that has been hand tool cleaned, because hand tools can scar the surface, leaving it with high and low areas. Epoxy mastics are also quite popular for hand tool-cleaned surfaces.

A hand tool-cleaned surface is desirable for applications where a low-cost cleaning method is required and a short-life paint system can be tolerated. Remember to be thorough in hand tool cleaning operations, and don't let fatigue lower the quality of your work. Always clean the surface with solvent to get rid of grease and oil before you begin hand tool cleaning, and avoid creating burrs on the steel.

ASSURING QUALITY HAND TOOL WORK

Hand tool cleaning is laborious and tiring. The quality of work can suffer as the day wears on. A worker must realize this and be more aware late in the day that the specification is followed.

Before you begin hand tool cleaning, make sure that dirt, grease, and oil have been removed from the surface. This can be achieved by solvent or detergent cleaning.

Some hand tools, such as chipping hammers, can cause a steel surface to burr.

A hand tool-cleaned surface is desirable for applications where a low-cost cleaning method is required and a short-life paint system can be tolerated.

HAND TOOL CLEANING STANDARDS

SSPC-SP 2, Hand Tool Cleaning: Photographs that illustrate the appearance of SSPC-SP 2 are found in the publication SSPC-Vis 3.

ISO 8501-1, Preparation of Steel Substrates Before Application of Paints and Related Products—Visual Assessment of Surface Cleanliness—Part 1: Rust Grades and Preparation of Uncoated Steel Substrates and of Steel Substrates After Overall Removal of Previous Coatings



Special care must be taken because burrs may protrude through the protective coating, causing a rust bloom and premature coating failure. After a surface is cleaned and is suspected to have burrs, it should be wiped with a rag, and if burrs are found, they should be sanded smooth. A chipping hammer should have a blunt edge. The intent is to remove rust, paint, and mill scale, and not to gouge the steel.

Power Tool Cleaning

To achieve a properly prepared surface using power tools, extreme care must be taken in choosing the proper tool and abrasive. Some of the more common reasons to use power tools are as follows.

Spot repair of existing coating systems: If only a few square feet on a bridge, tank, floor or other structure requires repair or touch-up, it would not make economic sense to mobilize large, efficient blast rigs.

As an adjunct to abrasive blasting: If abrasive or shot blasting is being carried out on a large structure, or if blasting has been completed, and water or other contaminant comes into contact with the clean surface, it would not make economic sense to remobilize. There also may be occasions where shot or abrasive blasting cannot reach certain areas.

In overcoating an existing coating system: If an existing coating is in good condition, but simply needs another topcoat, applicators may choose to use hand sanders or other power tools instead of abrasive blasting.

Lead abatement: Because of the numerous types of power tools and associated vacuum attachments, it may be economically more efficient to use these tools rather than other more popular, high-production types of systems.

In shop applications: In many cases, it would be inefficient for items to be run through the blast unit again.

BASIC FORMS OF POWER TOOLS

Although power tools come in a variety of shapes and sizes, they can be broken down into four basic categories:

- **Reciprocating sanders;**
- **Rotary or impact tools** (roto peening, scarifiers, bristle blasters);
- **Grinders;** and
- **Reciprocating impact tools** (needle guns and scabblers).

Because of their higher productivity compared to reciprocating sanders and orbital grinders, rotary impact tools are typically the best choice for removing coatings and creating an anchor pattern. For spots that are difficult to reach and areas not accessible to large rotary impact tools, needle guns, scalers, roto peening or bristle blasters can be used.

In short, an operator can look at large rotary scarifiers as the "paint roller" and smaller impact tools as the "paint brush." Like paint rollers, rotary scarifiers are used for larger, more accessible areas, whereas reciprocating or smaller impact tools, like paint brushes, are used for detail work such as reaching into corners and hard-to-reach areas. On average, one can expect a rotary impact tool's productivity to be at least 5

Editor's Note: This section is excerpted from an article written by Ralph Fabian of DESCO and originally published in the October 2005 JPCL. It was previously updated for the February 2014 JPCL and has been updated for publication in this issue.

PHOTO: THAWEESAK THIPPHAMON / GETTY IMAGES

to 7 times greater than the productivity of a needle scaler for most applications.

Furthermore, for removal of hazardous coatings or other contaminated materials, impact and rotary impact tools will usually generate the lowest levels of airborne contaminants. The chipping action of these tools when removing coatings and other unwanted material typically produces larger and heavier waste, which is more easily contained. On the other hand, when sanders and grinders remove coatings, a very fine, dust-like material is produced. Because of the high revolutions per minute (rpms) generated by most grinders and sanders, the dust-like material produced combined with the velocity of the particulate can create containment problems if tools are not properly shrouded and operated.

All of the above-mentioned tool groups are available in portable, hand-held, and walk-behind configurations. Most hand-held power tools are available in both electric as well as pneumatic (air) power. Reciprocating tools require the least amount of air supply, while larger sanders or rotary scarifiers consume the most air. Larger, walk-behind machines are available in electric, pneumatic, gasoline-powered and propane-powered.

RECIPROCATING IMPACT TOOLS

Examples of reciprocating impact tools include needle guns, chipping guns or hammers and scabblers. These tools are most commonly characterized by an air-driven chisel or piston that is designed to strike a surface. Chisels and pistons come in a variety of shapes and sizes to adapt to varying applications. Needle guns are typically used for cleaning small areas or areas that are not accessible to rotary impact equipment because of limited clearance. Scabblers tend to be much more aggressive and are used for breaking up heavy rust, mill scale, coatings, or concrete. When using impact tools, an operator must take extreme care to avoid gouging or destroying the substrate.

ROTARY IMPACT AND SCARIFYING TOOLS

Rotary impact tools are characterized by any of a variety of rotating heads, which strike the surface at a 90-degree angle. These tools are not to be confused with grinders, which also have a circular motion but do not strike the surface.

Scarifiers use a drum with moving steel or carbide-tipped cutters that are available in a variety of shapes, depending on the application. Bristle blasters use heavy wire-type drums, while roto peening equipment uses smaller, circular steel tabs secured to a fabric wheel.

SANDERS AND GRINDERS

Sanders and grinders come in a variety of shapes and sizes. Smaller, palm-sized tools allow operators to perform detailed work in difficult-to-reach areas, whereas larger sanders can be used for heavier grinding and production work. The four primary cutting mechanisms used with these tools are coated abrasives, non-woven abrasives, wire brushes and diamond-tipped wheels.

Although wire brushes can remove coatings and loose mill scale, they will not completely remove rust. Wire brushes have a tendency to burnish or polish the rust, eventually resulting in rust-back and coating failure. Depending on the disc, coated abrasives can be used for removing paint, mill scale and grinding rust. Unfortunately, coated abrasives have a tendency to load or clog up, requiring frequent change outs, and they can damage a substrate if not used properly. Non-woven discs can be used effectively for scuffing and feathering paint, as well as removing rust and corrosion from steel substrates. Because of their design, non-woven discs will not load up like coated abrasive discs and will provide more constant performance throughout the life of the disc. Diamond abrasives are very effective for grinding and finishing concrete.

THE RIGHT TOOL FOR THE RIGHT JOB

When choosing the best-suited power tool for any given job, certain factors should be considered, such as the level of cleanliness

When choosing the best-suited power tool for any given job, certain factors should be considered, such as the level of cleanliness and profile required, the coatings to be removed, and environmental concerns.



PHOTO: SURASAK PETCHANG / GETTY IMAGES



PHOTO: ANA-O / GETTY IMAGES

and profile required, the coatings to be removed, and environmental concerns.

Rotary impact tools are most often the best choice for removing coatings. Typically, rotary impact tools are used for the bulk of the work, while reciprocating impact tools such as needle guns and chisels are used for detailed areas not accessible to the rotary impact tools. In addition to being faster, rotary impact tools can create a profile on the steel, which will allow the coatings to adhere. Sanders are typically used for removing residual surface contaminants, feathering edges and repairing spot failures.

Rotary impact tools outfitted with roto peen abrasive hubs, or impact tools such as bristle blasters, are often the first choice for removing fracturable coatings, such as epoxies up to 15 mils thick. An operator can expect to remove the majority of a coating, while leaving a 1 to 3 mil surface profile. Care must be taken not to run roto peen over protruding objects or off the edge of a substrate. Doing so will result in damage to the abrasive bit. It is critical that operators use these devices at the appropriate height adjustment and rpm. Failure to do so will result in significant reduction in life and damage to the abrasive. When used properly, roto peen can last 60 hours or more; when used improperly, the abrasive can be destroyed in minutes. It is not uncommon for residual primer to be left in the pits of the substrate. If SSPC-SP 11 is required, a secondary operation using a non-woven abrasive may be necessary to remove the residual primer.

For heavy, fracturable and non-fracturable coatings, rotary scarifiers and scabblers offer the best method of coating removal. These tools basically cut or shear the coating from the substrate. Certain urethanes and other coatings are so soft and flexible that roto peen, roto hammers, and needle scarifiers will do little more than bounce off the coating surface. With some coatings, such as self-leveling/cementitious coating systems used on concrete floors, the best method for removal is often through chipping hammers, scabblers, or scarifiers. The primary objective with these applications is again to shear or cut the coating from the substrate surface. Care must be used with these tools as it is possible to remove significant amounts of concrete substrate along with the coating.

Projects do not always require complete coating removal. Many applications simply require a contractor to scuff and feather coatings or remove loose coatings before applying a fresh coat of paint. Sanders outfitted with a variety of abrasives most often are the best choice for this type of surface preparation, as they are well suited for removing rust and corrosion and other surface contaminants. Wire cup wheels are often used for removing loose coatings from substrates. Unfortunately, because of their tendency to burnish the surface, the level of cleanliness and finish is not suitable for many types of coatings systems. Nylon non-woven abrasives are excellent for scuffing and feathering coatings while resisting the loading factor experienced with most coated abrasive products.

Vacuum-assisted power tools provide an excellent option for removing hazardous coatings or in removing coatings in environments where nuisance dust is a concern. When used properly, vacuum-assisted power tools are capable of grinding, cleaning, peening, or scarifying in a virtually dust-free environment. When choosing a system, you must ensure that the vacuum used is appropriate for the application.

POWER TOOL CLEANING STANDARDS

SSPC-SP 3, Power Tool Cleaning SSPC-SP 11, Power Tool Cleaning to Bare Metal: When preparing any surface area to an SSPC-SP 11 finish, the level of cleanliness acceptable is never the same in all cases. What is acceptable will depend on the original state of the steel substrate before initial coating application.

SSPC-SP 15, Commercial Grade Power Tool Cleaning: SP 15 permits random staining to remain on a defined percentage of the cleaned surface, while SP 11 requires removal of surface staining. The standard differs from SP 3 in that a higher degree of surface cleanliness is required.

MAINTAINING AND SERVICING EQUIPMENT

For maximum performance and longevity from power surface preparation tools, set up a periodic maintenance and servicing program. During maintenance intervals, tools should be lubricated per manufacturer specifications. They should also be taken apart and the bearings should be greased (where applicable) and inspected for wear in such areas as bushings, bearings, air motor veins, and other areas as recommended by the manufacturer. Proper maintenance will prevent costly repairs in the future.

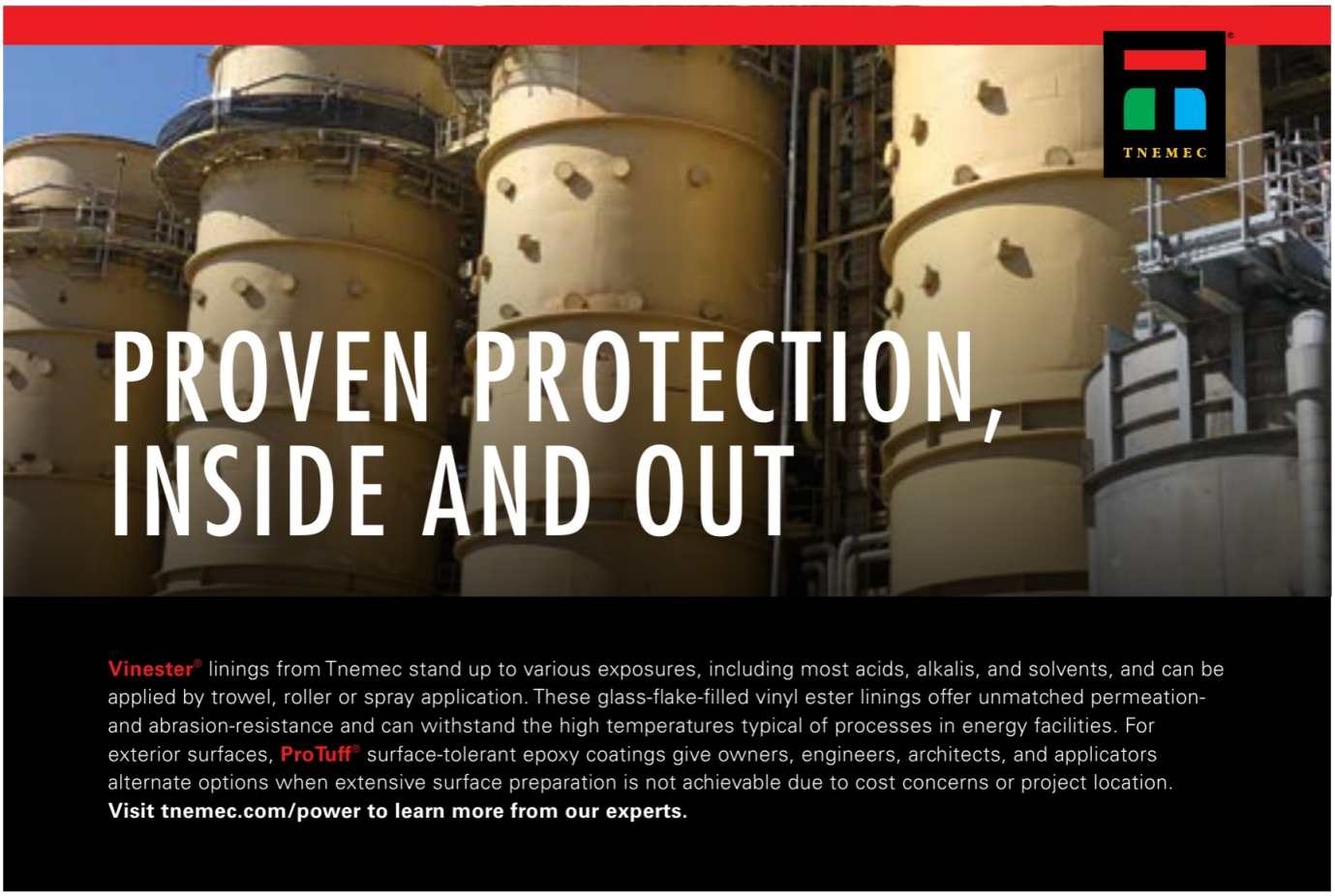
Conclusion

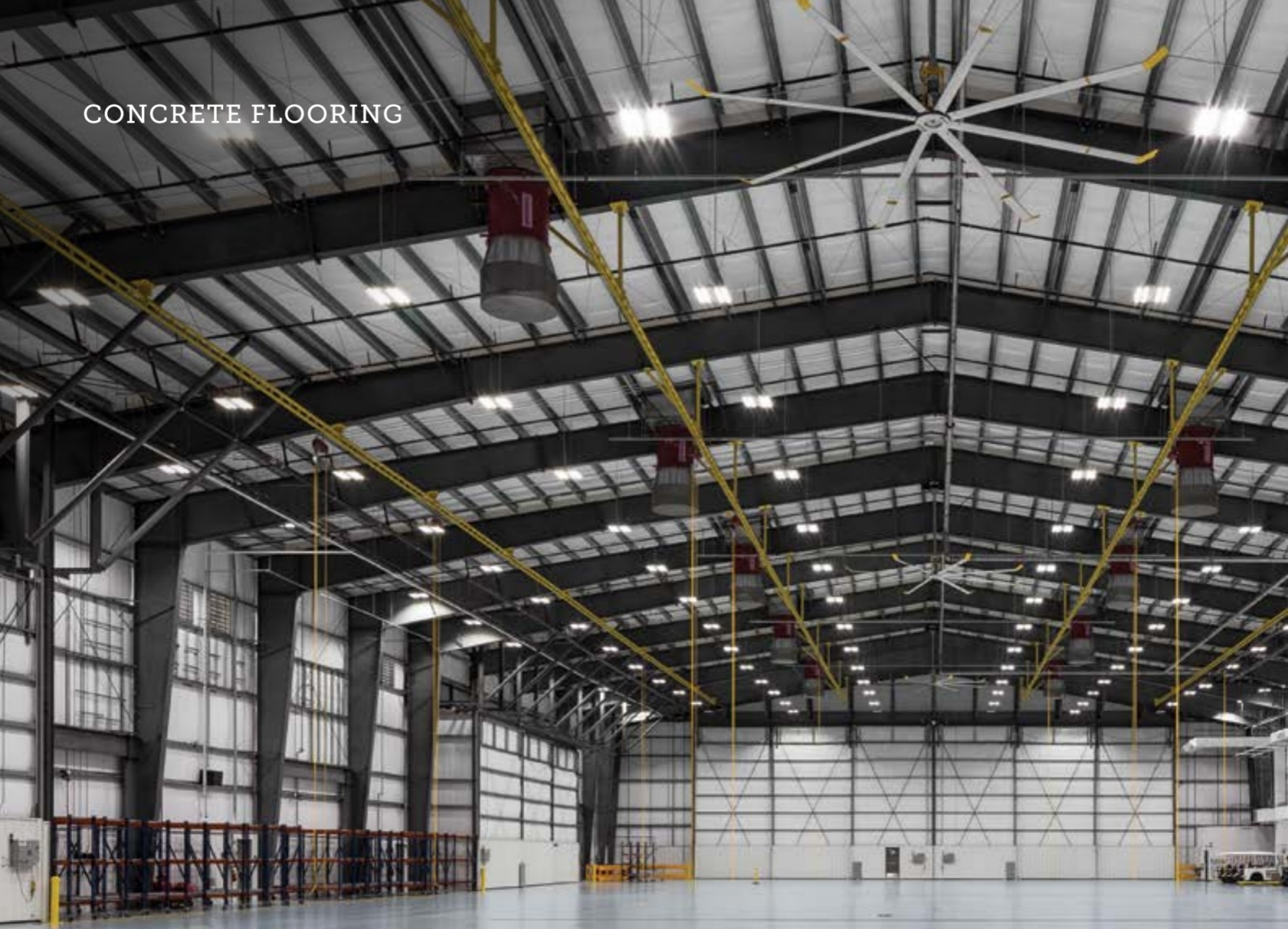
Surface preparation is a multi-faceted process. When selecting a hand tool or power tool for a job, take into account the coatings being removed, the surface to be prepared, the level of cleanliness required, surface profile required and, most importantly, the protection of the worker and the environment.

When working with any type of tool that has moving parts, proper safety precautions must be taken to prevent operator injury. Due to the dramatically different types and sizes of tools mentioned here, it would be potentially misleading to try and list all of the safety issues. Be sure to follow all appropriate safety precautions when operating power surface preparation tools and other pieces of equipment.

By taking these factors into consideration, an operator will have the necessary information to make the best choice in selecting the appropriate tool and abrasive for each application. Selecting the proper equipment will enable an operator to save time and money while achieving maximum performance from the new coating system. JPCL

Selecting the proper tool will enable an operator to save time and money while achieving maximum performance from the new coating system.





TAKING THE SHOCK OUT OF ELECTRIC VEHICLE BATTERY PRODUCTION FACILITIES

How Electrostatic Dissipative Flooring Protects Plants, Personnel and Profits

BY CASEY BALL, SHERWIN-WILLIAMS HIGH PERFORMANCE FLOORING,
AND EUGENE GEISZ, SHERWIN-WILLIAMS PROTECTIVE & MARINE



FIG. 1: ESD floors are required in various manufacturing environments, such as this aircraft assembly hangar, to protect sensitive equipment from damaging electrostatic shocks.

PHOTO: COURTESY OF THE AUTHORS

As you walk across a room toward the light switch, you know it's coming. You may even wince prematurely as you reach out, anticipating a jolt, yet hoping for just a small sizzle. Sure enough ... zap! A tiny bolt of electricity shoots from your fingertip, connects with the switch and causes you to recoil. While that relatively small zap may be a minor nuisance to you, the release of this electrostatic charge could have major ramifications in various environments. A small electrostatic discharge could take out computers and production equipment. It could even ignite fumes or dry powders in enclosed spaces, causing explosions and fires.

Fortunately, there's an effective way to prevent the typically minor nuisance of static electricity from becoming a major operational or safety issue. It starts from the ground up with the installation of resinous electrostatic dissipative (ESD) flooring systems. Such flooring is designed to drain the electrical charge that builds up in our bodies such that no shock occurs when a person comes into contact with a surface that's oppositely charged. With minimal to no charge available to release, equipment shouldn't be affected, and fumes or powders won't ignite.

ESD floors are necessary in an array of environments to protect sensitive equipment and employees ***(Fig. 1)***. They're especially important for the plethora of battery facilities popping up throughout North America to meet the burgeoning demands of the electric vehicle (EV) market. These facilities require ESD flooring in various cleanroom-level production areas to prevent millions of dollars in damage if a static shock were to take machinery offline or ignite fumes in wet processing areas.

With billions invested in EV battery facilities that exceed three-million square feet under one roof, it's critical to get ESD flooring specified and installed correctly. This article will explain why electrostatic charges occur in the first place and how to mitigate them in critical areas using ESD flooring.

Nothing's Shocking

Static electricity is a well-known phenomenon – from that familiar snap at a light switch to the literally hair-raising experience of rubbing a balloon on your shirt and holding it up to your head. It occurs as we walk across nearly any surface – resinous floors, carpets, laminates, tile and more. The resulting friction causes a negative charge to build in our bodies as electrons transfer from the surface underfoot. We collect and store these electrons until we come into contact with a surface containing fewer electrons. Then, the excess electrons leap from our bodies to the more positively charged surface, causing that familiar spark and jolt.

FIG. 2 *(above):* Production areas housing sensitive microelectronics require ESD flooring to prevent even tiny static shocks from harming equipment.



FIG. 3 *(right):* Resinous ESD flooring installed in this storage facility for sensitive packaged electronics will help to drain the charge that builds up inside a person walking through the area to protect those products from damage.

PHOTOS: COURTESY OF THE AUTHORS

To even feel a static electric shock, the discharge must be a minimum of 3,500 volts. Yet, a discharge of just 20 volts can damage or ruin sensitive microelectronics. That's why it's so critical for EV battery plants and other facilities housing sensitive electronic devices to mitigate this shock potential ***(Fig. 2, previous page)***. In fact, many such locations operate facility-wide ESD programs that call for specific flooring materials and supplementary accessories such as special footwear, antistatic wrist straps and floor mats with grounding cords. These control mechanisms all help to drain the energy stored in our bodies away to the ground.

Resinous ESD flooring works by enabling any charge that builds up inside a person walking through a room to immediately transfer to conductive elements embedded within the flooring material itself and then to the ground ***(Fig. 3, previous page)***. This direct, uninterrupted connection may be made by embedding a copper strip within the conductive flooring layers and connecting that strip to a metal floor joist, steel post, the grounding terminal of an existing electrical outlet or another grounding point ***(Fig. 4)***.

In EV battery facilities, ESD flooring is primarily used to protect equipment from damaging shocks and prevent facilities from catching fire. In the cleanroom-level environments for battery production, high levels of filtration and low humidity levels create a dry environment with a high potential for static electricity. In such areas, an unmitigated electrostatic discharge could short circuit sensitive battery manufacturing equipment. In addition, in wet processing areas, flammable chemicals, including slurries and N-methyl-2-pyrrolidone (NMP) used in the manufacturing of EV cells, could ignite due to a spark. However, with ESD flooring properly installed in these areas, nothing's shocking because any electrical charge is immediately dissipated to the ground.

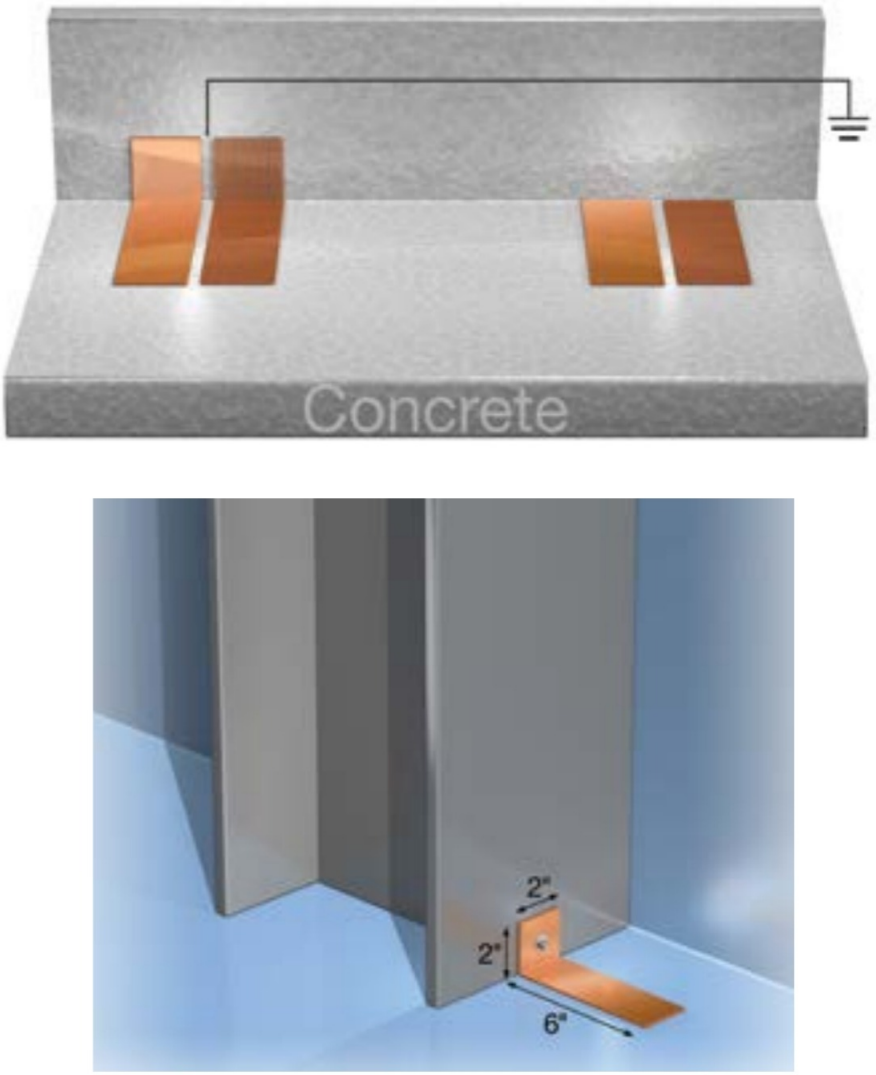


FIG. 4: **Establishing a direct, uninterrupted connection may be done by embedding copper tape within the flooring and connecting that to an existing electrical outlet *(top)* or another grounding point such as a steel post *(bottom)*.**

ILLUSTRATIONS: COURTESY OF THE AUTHORS

Comparing Options: Urethanes vs. Epoxies

While typical automotive production environments feature resinous epoxy flooring, EV battery facilities are best served by specifying ESD urethane flooring for production areas. The primary reasons include the efficiency and ease of installation for the material, as well as its superior durability and chemical resistance.

With epoxies, it can be more difficult and time consuming to incorporate ESD mechanisms into the resinous material than with urethanes. In both cases, installers must create small batches of resins and mix in conductive ESD components. In addition, mixing errors have the potential to limit the conductivity of the flooring,





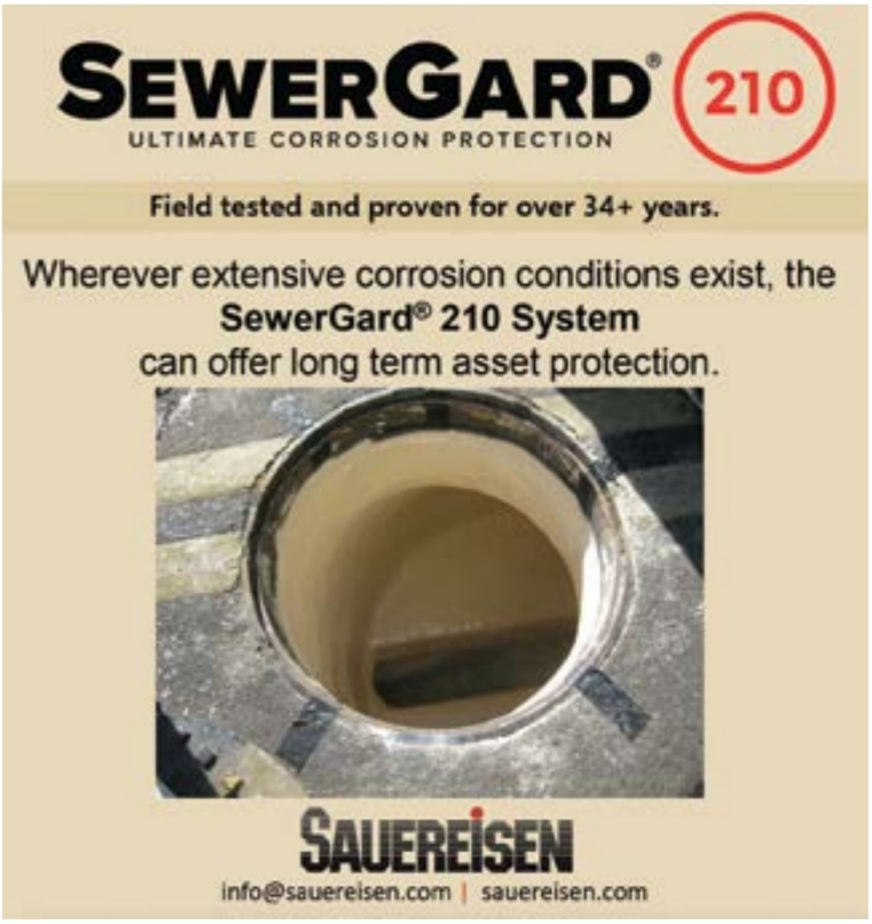
FIG. 5: Durable urethane ESD flooring systems are recommended for warehousing areas over epoxies due to their greater resistance to scratches, wear and chemicals.

PHOTO: COURTESY OF THE AUTHORS

A typical ESD flooring system includes the following layers: a concrete substrate, an optimal moisture mitigation layer, copper earthing tape, an ESD primer coat and an ESD topcoat.

leaving dead zones that don't enable charges to dissipate when not using pre-measured kits. Such dead spots are more likely to occur when using the more difficult to mix epoxy formulations.

Beyond their efficiency advantages, urethane ESD flooring systems are also more durable – up to four times more wear resistant – than epoxies ***(Fig. 5)***. That includes having superior scratch and wear resistance, as well as greater resistance to chemicals, including harsh cleaning agents and corrosive materials like the slurries and NMP used in battery cell production. NMP is especially aggressive and can destroy an epoxy coating within two hours of exposure, while a urethane coating can resist the chemical for 14 days. In addition, urethane flooring systems have superior ultraviolet (UV) stability compared to epoxies, which tend to yellow and chalk under UV exposure.



Dissipating Static from the Top Down

Effectively controlling electrostatic discharges requires the installation of a multi-layer flooring system featuring small strips of a grounding material that connects the flooring to a permanent, uninterrupted earth ground. This setup creates an electrical equipotential plane (EP), a condition in which static electricity can be dissipated in any direction. While an excellent grounding mechanism itself, concrete cannot serve as an EP because the air pockets, compositional variations, aggregates and other additives present in the material may not permit uniform conductivity. That's where ESD flooring comes in.

A typical ESD flooring system includes the following layers: a concrete substrate, an optional moisture mitigation layer, copper earthing tape, an ESD primer coat and an ESD topcoat ***(Fig. 6)***.

Installers can apply resinous ESD flooring to new or existing concrete. They must first shotblast and grind the concrete as needed to achieve a sufficient concrete surface profile (CSP) — typically of CSP 3 for urethane ESD floors. If the concrete is new, installers can wait just seven days, instead of the traditional minimum 28-day wait for green concrete, if they apply a moisture mitigation primer. This layer seals the concrete so moisture and air cannot outgas and cause bubbling underneath the flooring material. This primer may also be used to fill in any irregularities within the concrete.

Next, installers must create a true earth ground via direct, uninterrupted contact between the top of the conductive flooring surface and a grounding point. Copper grounding tape is recommended over copper wire due to its greater surface contact area and thinner profile. A full grid covering the entire room is not required. Instead, installers should apply a minimum of six inches of two-inch-wide copper tape on top of the concrete substrate or optional primer layer and ultimately connect that tape to an established grounding point. In general, areas should have a minimum of one grounding point per 1,000 square feet of continuous floor space to properly dissipate static electricity.

If any seams exist in the concrete substrate, it's important to ensure no section is isolated from electrical continuity and therefore the grounding path. This may require using a copper strip featuring a ¼-inch "V" notch to bridge existing joints in the concrete ***(Fig. 7)***.

FIG. 6: **A common ESD flooring system includes the following layers applied on top of the concrete substrate: 1. Copper earthing tape; 2. An ESD primer coat; 3. An ESD epoxy build coat; and 4/5. An ESD urethane with a high wear additive.**

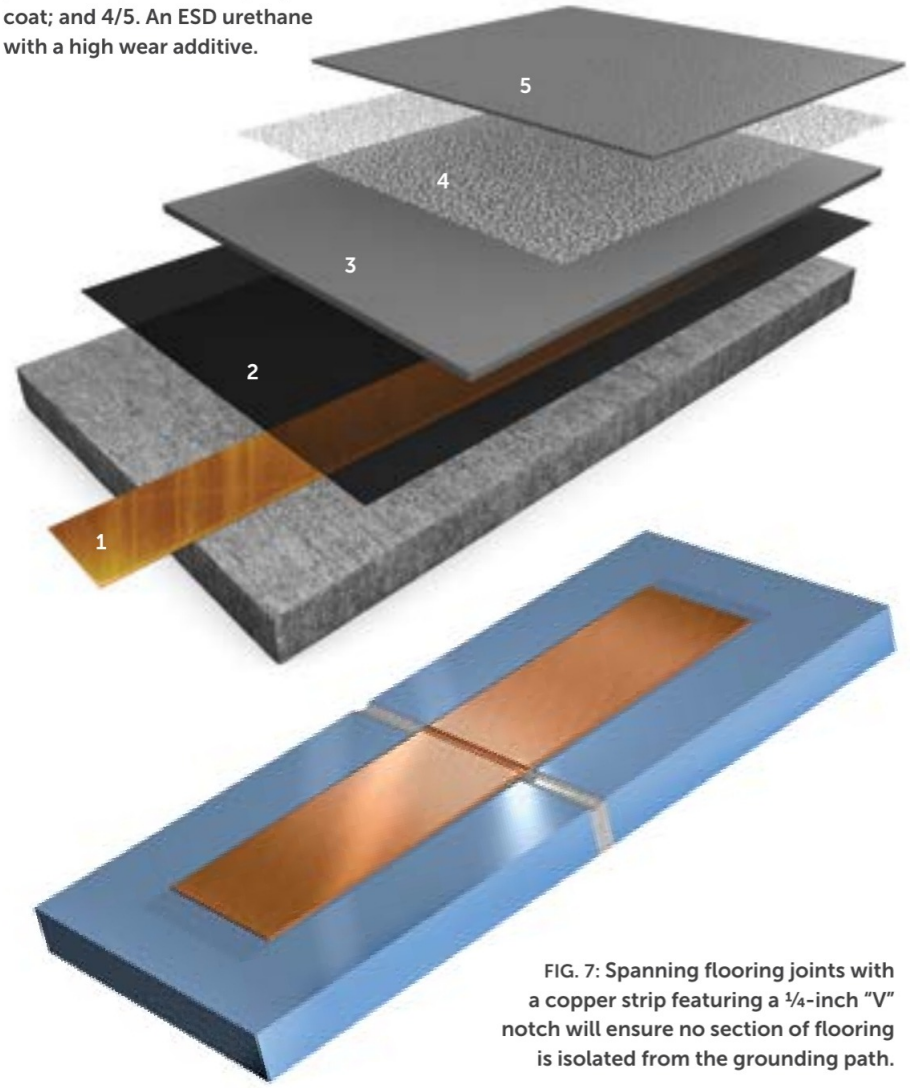


FIG. 7: **Spanning flooring joints with a copper strip featuring a ¼-inch "V" notch will ensure no section of flooring is isolated from the grounding path.**

ILLUSTRATIONS: COURTESY OF THE AUTHORS

The installer should then test the continuity of the grounding system, following the ASTM F150-06 Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring, to confirm it will dissipate the required charge. Installers may perform surface to surface testing to check the conductivity between two metal electrodes placed 36 inches apart on the floor, using an ohmmeter to determine the resistance from point to point within the flooring ***(Fig. 8)***. In addition, they may do surface to ground testing by placing one electrode on the floor 36 inches away from another electrode attached to the grounding connection to confirm the resistance to the ground.

Next, installers will apply an ESD primer coat over top of the grounding tape. This coat includes a variety of conductive filler components, such as carbon black or nickel-coated carbon fibers, which enable conductivity of this layer between the topcoat and the grounding tape. Again, the flooring installer should verify the conductivity of this primer layer after curing to ensure it is less than 0.050 M ohms when tested in accordance with ASTM F150-06.



FIG. 8: **Following the ASTM F150-06 Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring, inspectors can confirm the dissipative qualities of the flooring by using electrodes and an ohmmeter.**

The final layer is an ESD topcoat (or topcoats) that comprises conductive fillers and resin components and pigments. The conductive components complete the circuit from a person walking on the floor to the topcoat to the primer to the grounding tape below. The resin materials provide an aesthetically pleasing floor finish that's resistant to chemical attack and abrasion. Following curing, a third-party electrical contractor or engineer should provide final verification of the flooring system's conductivity. Final readings should provide an electrical conductivity leakage resistance of between 1.0 x 106 ohms and 1.0 x 109 ohms for an ESD floor when tested to the ASTM F150-06 standard.

For both the ESD primer and topcoat applications, it is critical for installers to not exceed the millage specifications of the ESD materials. The conductive components added to the coatings must be accessible on the surface to complete the circuit from the flooring to the grounding point. If too much material is applied, the thicker resin may shield this path and not allow electrostatic charges to dissipate sufficiently through the flooring.

Ensuring Continued Dissipation

The intermediate inspections that take place during ESD flooring installations are critical hold points that help to ensure the flooring can drain the specified charge from personnel working in the area. Without these checks, installers run the risk of encountering major delays and expenses. That's because if a floor for an EV battery facility fails the final conductivity test, it may need to be removed and reinstalled.

Following installation, it's important to periodically inspect ESD flooring to ensure it maintains the proper conductivity. This inspection frequency may depend on the amount of traffic and wear the flooring encounters, as repeated, heavy traffic may cause the topcoat to wear down and elevate the floor's electrical charge, causing it to become too conductive. Again, an electrical contractor will be the best source for this testing. If readings show a trend in either direction, there are ways to stabilize the conductivity.

The cleanliness of the floor can also affect its ability to dissipate electrostatic charges. For example, dust, grime, wax or even a heavy surfactant residue from a cleaning agent can create a sufficient barrier between one's foot and the

Following installation, it's important to periodically inspect ESP flooring to ensure that it maintains the proper conductivity.

PHOTO/ILLUSTRATIONS: COURTESY OF THE AUTHORS

conductive elements inside the ESD flooring to inhibit – or even block – the flow of electrons to a grounding point ***(Fig. 9)***. This may render the ESD flooring nearly useless and elevate the potential for damaging electrostatic shocks. Some harsh cleaners may even destroy conductive particles in the flooring or cause them to leach out, minimizing the flooring's effectiveness. Given these possibilities, facility managers will want to follow strict maintenance guidelines to ensure their flooring maintains its integrity. That may include using quaternary ammonium compounds when sanitation is required, as well as softened water to prevent hard water scaling from shielding the floor's conductive components.

Conclusion: Stop the Shock

Electrostatic discharges are not an option in EV battery manufacturing plants. Thankfully, resinous urethane ESD flooring offers a functional way to effectively mitigate their potential, protecting equipment, facilities and personnel. Compared to epoxies, more durable and chemical-resistant ESD urethane flooring better withstands demanding EV battery cell production environments. In addition, the continuous monolithic flooring surface eliminates the grout lines and potential weak spots found in ESD tile installations. Still, resinous urethane ESD flooring must be installed properly and inspected frequently to ensure its effectiveness. Working with knowledgeable flooring suppliers, installers and inspectors will help the entire project team achieve success from installation through continued operation. JPCL



FIG. 9: It's important for facility managers to keep ESD flooring clean so it can effectively dissipate electrostatic charges.

PHOTOS: COURTESY OF THE AUTHORS

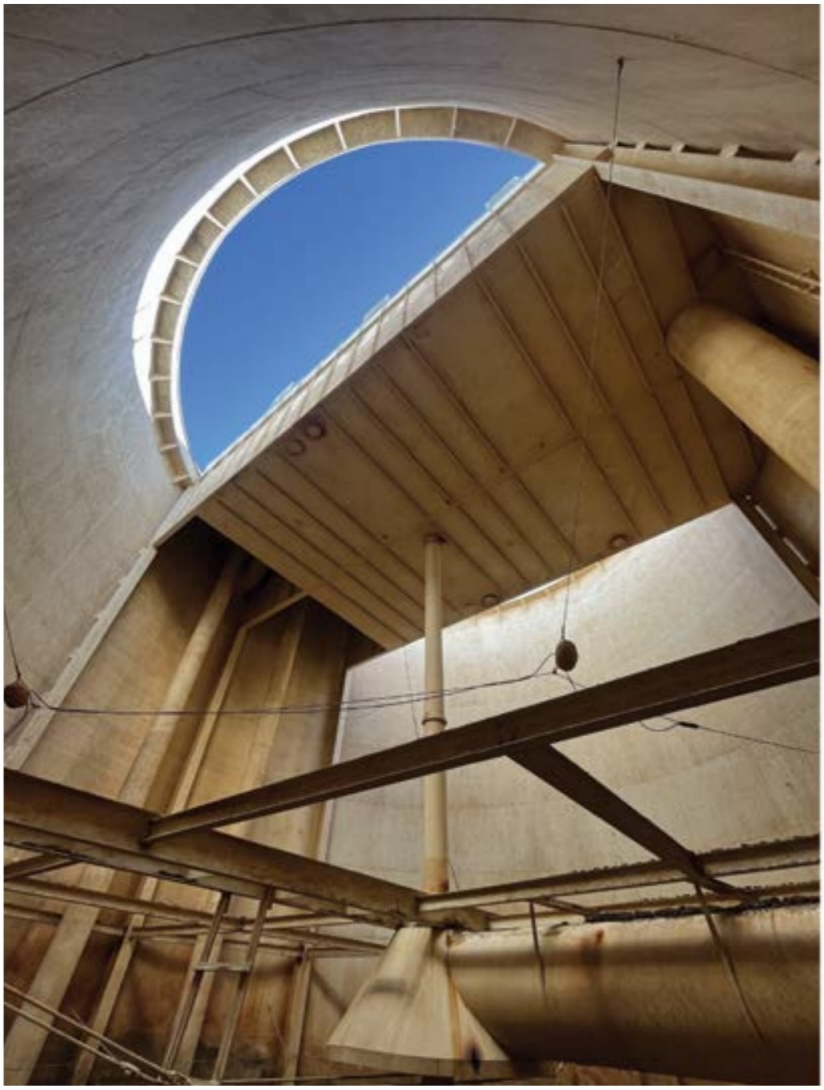
ABOUT THE AUTHORS



Casey Ball is the Global Market Director for Sherwin-Williams High Performance Flooring. He previously served as a Project Development Manager, drawing on his experience as a Corrosion Specification Specialist and a Technical Service Rep for Sherwin-Williams after starting his career as a Lab Technician at General Polymers. Ball has specialized in the flooring and coatings market with the Sherwin-Williams Company for 21 years. He is a NACE-certified Coating Inspector and an SSPC-certified Concrete Coatings Inspector. He holds a bachelor's degree in business from Wilmington College and earned his MBA in marketing from Franklin University.



Eugene Geisz is the Global Marketing Director – Manufacturing & Processing for Sherwin-Williams Protective & Marine. He started his career as a process engineer for a pharmaceutical manufacturer before entering the coatings industry. There, over a period of 17 years, Geisz took on various sales and marketing roles, including Business Development Manager, Global Account Manager and Regional Sales Manager, covering the aerospace and general industrial coatings markets before moving into his current position. He holds a bachelor's degree in chemical engineering from Western Michigan University and an MBA from Purdue Krannert School of Business.





NEWS FROM THE TRACKER

VA Water Treatment Plant, IL Bridge Rehab Jobs Awarded; MD WWTP Project Out to Bid

BY KONSTANTINE FEKOS, PAINT BIDTRACKER

PROJECT AWARDS

The **City of Lynchburg, Virginia**, has awarded a $1,787,000 contract to MEB General Contractors (Chesapeake, Virginia) for a mixer replacement project that involves replacement and coating of 12 vertical paddle flocculators and two clarifier drives at the city's College Hill Water Treatment Plant.

The work includes applying three coats of an NSF 600-approved polyamide epoxy system on ferrous metal surfaces. Before coating application, submerged surfaces must be abrasive blast-cleaned to a Near-White Metal (SSPC-SP 10/NACE No. 2) finish, while non-submerged surfaces will be abrasive blast-cleaned to a Commercial (SSPC-SP 6/NACE No. 3) finish. After coating application, high-voltage holiday inspection with as-needed repairs will be performed. Specified coating manufacturers include Carboline, Sherwin-Williams and Tnemec, or an approved equal.

MEB General Contractors was one of two bidders; the other bid came in from English Construction Company Inc. (Lynchburg, Virginia) in the amount of $2,414,000.

PHOTOS: COURTESY OF CITY OF LYNCHBURG

Venus Painting Company (Valparaiso, Indiana) has secured a contract from the **Illinois Department of Transportation** for painting of various existing bridge structures in Macon County, Illinois.

The contract, valued at $800,724, includes lump sum items for cleaning and coating structural steel. The steel will be abrasive blast-cleaned to a Near White Metal (SSPC-SP 10/NACE No. 2) finish and recoated with the ILDOT System 1, which includes an organic zinc-rich primer, an epoxy intermediate and a urethane finish. Approved coating manufacturers include Carboline and Sherwin-Williams. Containment and disposal of lead-based paint cleaning residue is required.

Venus Painting Company was one of five bidders. Other bits submitted included:

- Era Valdivia Contractors, Inc. (Chicago), in the amount of $1,244,736;
- Civil Coatings and Construction Inc. (Valparaiso, Indiana), in the amount of $1,257,094;
- Three Star Painting, Inc. (Merrillville, Indiana), in the amount of $1,262,522; and
- Eagle Painting & Maintenance Company, Inc. (Lansing, Illinois), in the amount of $1,292,039.



MAP: MALACHY120 / GETTY IMAGES; PHOTO: COURTESY OF ANNE ARUNDEL COUNTY



PROJECT PREVIEW

Anne Arundel County is soliciting bids for Phase 2 upgrades to the Annapolis Water Reclamation Facility on Edgewood Road in Annapolis, Maryland.

Exterior work involves applying a three-coat epoxy system on miscellaneous metal substrates, excluding aluminum and stainless steel. Interior work is scheduled to include applying a three-coat epoxy and latex system on galvanized metal surfaces. Surfaces will require preparation in accordance with standards for Hand Tool Cleaning (SSPC-SP 2), Pickling (SSPC-SP 8) and Near-White Metal Blast Cleaning (SSPC-SP 10/NACE No. 2). The owner-specified manufacturers for this project include Sauereisen, Sherwin-Williams and Tnemec.

The submittal date for this project is Aug. 1.

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