



# TWO-COAT SYSTEMS THAT MOVE STEEL FASTER

How Modern Two-Coat Systems Improve Throughput, Reduce Labor and Preserve Long-Term Performance Across Steel Markets

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# TWO-COAT SYSTEMS THAT MOVE STEEL FASTER

## How Modern Two-Coat Systems Improve Throughput, Reduce Labor and Preserve Long-Term Performance Across Steel Markets

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Fabricators have always balanced two pressures that rarely ease at the same time — 1) keep steel moving through the shop; and 2) meet coating performance requirements that will hold up for decades in the field. That tension is sharper now, with tighter project schedules, persistent labor constraints and owners who still expect the same corrosion control and appearance they've specified for years.

Two-coat systems are gaining ground because they address both realities at once. They take an entire application step out of the workflow, but they do not ask teams to abandon the protection targets that made three-coat systems the default for so long. The intermediate coat goes away, and the topcoat is engineered to do more.

For the shop, the main benefit is time. For owners and engineers, the question is whether that time is being saved responsibly. For specifiers, this only works if performance expectations remain intact and verifiable.

The biggest gains often come from what happens between spray passes — cure windows, inspection holds and touch-up loops — and from the primer selection. Pair the right zinc primer with a modern high-performance finish such as a polysiloxane and the throughput equation can change by hours or, in the right workflow, by full days.

### FEWER COATS, FASTER RELEASE

Many structural steel specifications still begin with a familiar three-coat architecture: a zinc-rich primer for corrosion control, an intermediate coat to build film thickness and protect the primer, and a finish coat for weathering resistance and appearance. It works, but it's also time intensive.

Even when spray application itself is efficient, a three-coat workflow adds cure and handling delays between coats and increases the number of inspection and touch-up cycles that slow release. Every coat is more than a spray

pass: it also involves staging, cure, inspection, touch-up and another cure before the next step can proceed. Those gaps are where shops lose throughput when a bay is full of steel that is “done spraying” but not yet ready to move.

A two-coat system removes the intermediate step and places more responsibility on the topcoat. In a modern two-coat build, the second coat functions as both film build and finish. Eliminating one full coating application can reduce coating labor by roughly one-third in many shop workflows. The bigger lever is time: a shorter cycle per piece becomes a throughput multiplier across an entire steel package.

### PROOF AND PRACTICE

Two coats can feel counterintuitive to stakeholders who have lived through coating failures driven by missed areas, thin films, pinholes or holidays. The instinct is understandable. If three coats add redundancy, taking one away can feel like added risk because the system is being asked to do the same job with different chemistry and different layer roles. However, modern two-coat systems are built around coatings engineered to do more per layer, backed by qualification data and clearer expectations around application and inspection.

For bridge steel, validation has come in part through the National Transportation Product Evaluation Program, and now AASHTO Product Evaluation & Audit Solutions. In referenced evaluations, reduced-coat systems pairing zinc-rich primers with polysiloxane topcoats met the long-standing corrosion-undercutting limits used to define protection in three-coat zinc-rich coating systems required after ASTM D5894 cyclic weathering exposure. That data is what makes two coats defensible as an engineered system, not a shortcut.

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Two-coat systems still demand discipline — arguably more, because there's no intermediate layer to hide a miss. The approach only works when application quality is controlled, film thickness is verified and the inspection plan is aligned with how the system behaves.

## SYSTEM CHOICES

Two-coat systems are often described as a single idea. In practice, primer choice and topcoat chemistry are the variables that determine how the system behaves in production and how confidently it can be specified.

**Primer Sets the Pace.** Inorganic zinc primers are typically silicate based. They are widely associated with premium corrosion protection and remain common in bridge and highway specifications. They also tend to require tighter surface preparation control and longer cure schedules before recoat. In many shop workflows, an inorganic zinc primer may require 18 to 24 hours before touch-up or before the next application step can proceed.

Organic zinc-rich primers are commonly epoxy based. They still provide cathodic protection through high zinc loading, but their cure behavior is different and, in many cases, faster and more predictable for shop production. In documented shop timing comparisons, organic zinc primers have supported recoating in as little as one to three hours (Figure 1).



Figure 1. Shorter primer cure windows are where many two-coat schedule gains start – organic zinc primers can cut that waiting time significantly in shop-applied bridge steel.

That swing matters because it moves the longest clock in the workflow. And it repeats. If inspection identifies deficiencies that require primer touch-up, the primer has to cure again before the next step can proceed. A 15- to 23-hour difference once can become a full-day difference when it happens twice.

The Frederick Douglass Memorial Bridge project in Washington, D.C., illustrates how these factors compound. Based on AASHTO Product Evaluation & Audit Solutions testing, a two-coat system was selected for the bridge's structural steel, allowing the fabricator, Veritas Steel, to eliminate the intermediate coat. That removed one-third of coating application labor tied to a three-coat workflow and eliminated two to six hours of waiting time per piece of steel by skipping the intermediate step. Veritas Steel also chose an organic zinc primer, saving up to 23 hours of waiting time before touch-ups or topcoating compared to an inorganic zinc option. With the polysiloxane finish, the bridge was expected to maintain its corrosion protection and its white, glossy appearance for 25 to 30 years. The new bridge opened in September 2021 (Figure 2).



Figure 2. Structural steel for the Frederick Douglass Memorial Bridge in Washington, D.C. was shop coated and finished with a polysiloxane topcoat for long-term color and gloss retention. Image courtesy of Champion Painting Specialty Corp

**Topcoat Carries the Load.** In a two-coat system, the finish must provide durability and weathering resistance, while also contributing meaningful film build and protection in a single application step. That is why the conversation often centers on polysiloxanes and, in some specifications, polyaspartics.

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Polysiloxane technology is a common answer because it can combine characteristics typically split between an epoxy intermediate and a polyurethane finish. It is also compatible over both inorganic zinc and organic zinc primers, which provides flexibility for specifications and shop practices. Sher-Loxane® 800, for example, is positioned as an isocyanate-free polysiloxane finish and is promoted for long-term corrosion control and weatherability. (That no-isocyanate characteristic becomes relevant again when field work and multi-trade coordination are part of the schedule.)

Polyaspartic topcoats can also support fast handling times and have been used successfully in two-coat architectures, particularly where rapid cure is the priority. A practical distinction is that polyaspartics are generally tied to organic zinc primers in these systems. They are not typically recommended for use over inorganic zinc primers, which narrows primer flexibility.

## MARKETS AT A GLANCE

Steel does not know if it is headed to a bridge, a stadium or a semiconductor plant. But the environment around it does. The same two-coat architecture can serve multiple structural steel markets, even as each market brings its own stressors — salts, abrasion or contamination control — and its own definition of what performance has to include. In the shop, the benefits are consistent: fewer application steps, less waiting between coats, fewer opportunities for rework and faster release. In the field, the priorities shift.

**Stadiums and Venues.** Public venues combine high visibility with high contact. Over the course of a year, hundreds of thousands of people may move through a facility and unintentionally bump into and nick exposed steel. High-traffic conditions reward finishes that resist scratches, scuffs and abrasion, especially in areas where touch-up is disruptive or aesthetics are part of the owner's experience standard. In that context, polysiloxane finishes are often positioned as an all-encompassing structural steel topcoat: durable enough for day-to-day contact while maintaining appearance where exposed steel is part of the architectural intent.

**Bridges and Highways.** Bridge steel faces obvious corrosive drivers such as deicing salts (Figure 3).



Figure 3. On the Frederick Douglass Memorial Bridge steel, the organic zinc primer's shorter recoat window supported quicker topcoating and fewer hold points in the two-coat workflow. Image courtesy of Sherwin-Williams Protective & Marine.

Traffic introduces another challenge that is easier to overlook: hydrocarbon deposits from exhaust byproducts, oils and particulate matter. Those deposits can create a sticky layer that attracts dirt and airborne debris (Figure 4).



Figure 4. In-service bridge conditions can combine deicing salts with traffic-related deposits and moisture cycling — a mix that can drive cleaning demands and influence long-term coating performance. Image courtesy of Sherwin-Williams Protective & Marine.

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Once that contamination layer forms, it can hold moisture against the film and work against durability over time. Just as in stadium environments, where contact damage drives finish durability, bridge stakeholders have a maintenance reality to manage. Finishes described as having lower surface tension and dense films can be easier to clean, helping crews remove buildup with less effort and potentially extend the window between maintenance cycles.

**Advanced Manufacturing Plants.** Data centers, semiconductor fabrication facilities and EV battery plants add a different layer of scrutiny. These projects often move on compressed construction schedules, and then operate inside controlled environments where particulates and chemical sensitivity are production concerns. For semiconductor projects in particular, project teams are solving for airborne molecular contamination (AMC) — trace chemical vapors and aerosols that can migrate through the air stream and adhere to surfaces, affecting yield. Owners and engineers may evaluate coatings for resistance to degradation that could generate particulates and for cure behavior tied to outgassing. Practically, that means a finish needs to cure to a tough, stable film on a predictable timeline so construction can keep moving without introducing avoidable contamination concerns inside sensitive spaces.

**General Manufacturing and Processing.** In many plants, moisture, routine cleaning and repeated contact matter more than UV weathering. Food and beverage facilities, for example, can involve frequent washdowns and persistent wet conditions that elevate the importance of moisture resistance and film integrity. Just as in advanced manufacturing, the goal is not simply to coat steel and move on. It is to prevent the coating from becoming a recurring maintenance problem. Durable finishes that resist moisture intrusion and hold up to routine cleaning can reduce touch-up frequency and simplify maintenance planning.

**Water Infrastructure.** Water assets introduce a degradation pathway driven by condensation and biology. Where humid air meets cooler water, tanks can sweat. That moisture can hold dirt on the surface and encourage mold and mildew growth (Figure 5),



Figure 5. This water storage tank exterior showed widespread surface contamination and mildew buildup prior to maintenance. Image courtesy of Sherwin-Williams Protective & Marine.

particularly in shaded areas and high-vegetation environments. Over time, the back side of an elevated tank can look very different than the sun-facing side. Polysiloxane finishes are valued for their hydrophobic behavior and low surface tension characteristics, which can help shed environmental contamination and make surfaces easier to wash down once the tank has been recoated (Figure 6).



Figure 6. After recoating the tank with a Sher-Loxane® 800 finish, it features a restored appearance that will support long-term cleanliness. Image courtesy of Champion Painting.

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The goal is to keep the surface cleaner and drier so the conditions that encourage biological growth are reduced and maintenance becomes less disruptive.

## SHOP TO SITE

Even when a system is shop-applied, field realities are unavoidable. Steel is transported, handled, erected and bolted together. Connections are damaged, surfaces pick up dirt and touch-ups are necessary — often when schedules are least forgiving.

This is where coating selection affects more than corrosion control. Systems with practical recoat windows and predictable field cure help crews protect damaged areas and keep progress moving. It also supports multi-trade coordination. Isocyanate-free finishes can reduce the access constraints that sometimes come with urethane-based systems, particularly indoors, where other trades may need to work nearby or where teams are trying to avoid introducing unnecessary contamination into sensitive spaces. Fewer access restrictions means fewer delays.

The maintenance picture matters, too. When a coating system limits moisture intrusion and slows corrosion development, the first major maintenance cycle can be less invasive and less disruptive. If the coating has performed for decades with limited underfilm corrosion, future work is less likely to start with extensive removal and rebuild. Maintenance does not disappear, but upstream performance can change what maintenance looks like downstream.

## CLOSING VIEW

Two-coat systems are showing up more often for a simple reason: they remove a step that slows production without changing the performance target. The shift works when teams treat two coats as a purpose-built system — not a three-coat system with something taken away — and when they focus on where time is actually lost: cure windows, inspection holds and touch-up loops.

Put the pieces together — primer, topcoat and process — and you get what shops are after: fewer steps, faster release and a finish that still holds up over the long haul.

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## ABOUT THE AUTHORS

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Greg Hansen has been with Sherwin-Williams since 1995 and currently serves as the North America Manager for the Project Development team, specializing in engineering services for the power, water infrastructure, pharmaceutical, and food and beverage industries. He holds a degree in finance from Kansas State University with a focus on business strategy. Hansen is an AMPP-Certified Coatings Inspector and an AMPP Concrete Coatings Inspector. He is active in several local and regional trade associations dedicated to corrosion protection and has presented multiple times at the AMPP Annual Conference + Expo.

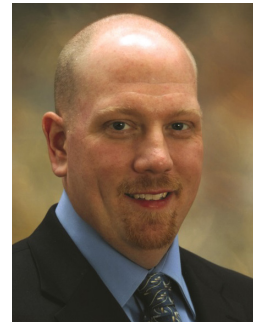
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