May 2021 Vol. 42 · No. 5 · $4.00

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Renovation · Restoration

Working on Top of the World: The Towers of Michigan's Mighty Mac Recoated, Repainted and Restored

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WORKING ON TOP OF THE WORLD

The Towers of Michigan's Mighty Mac Recoated, Repainted and Restored

By Mary Kremposky McArdle • Associate Editor

Photo credit: MDOT Photography Unit/Tim Burke

For Seaway Painting, water and sky and the Mighty Mac's soaring towers of steel make for a breathtaking jobsite. An award-winning platform and containment system (upper right) made possible the stripping to bare metal and subsequent recoating and repainting of these difficult-to-access towers for the first time since the bridge's original construction in 1957.

Imagine erecting almost 552 feet of scaffolding all the way to the top of the Mackinac Bridge. It's not only hard to imagine but even more difficult to actually build such a material- and labor-intensive system. Three Michigan firms produced an innovative alternative to access the towers of this graceful, ivory-colored bridge that has spanned the shimmering waters of the Straits of Mackinac for 64 years. Ruby + Associates, Inc., Bingham Farms, Seaway Painting LLC, Livonia, and Moran Iron Works, Onaway, delivered an award-winning engineering and logistical feat: a moveable jobsite in the sky capable of scaling the towers of the Mighty Mac.

The engineering, fabrication and installation of a system of moveable platforms made possible the complex steel cleaning and coating of a structure the Mackinac Bridge Authority calls the longest suspension bridge in the Western Hemisphere. Thanks to this dedicated team, the difficult-to-access towers were stripped down to bare metal, coated and repainted for the first time since the bridge's original construction in 1957.

The saga began in the kitchen of Seaway's Foreman Dan Halberg. According to Seaway Co-owner Steve Vlahakis, Halberg generated the concept of a custom suspended platform to access the towers, turning his concept into a small hand-built model at the kitchen table of his home in St. Ignace. As Structural Engineer of Record, Ruby + Associates converted the conceptual model of a single massive work platform into a series of segmented platforms bolted together in the field to become two, lightweight, movable, 24-foot-high platforms of aluminum and steel.

Moran Iron Works fabricated the two platforms, one designed to travel the soaring vertical pillars or "legs" of the north and south towers and the other designed to span the three horizontal struts between the pillars. The system enabled Seaway as prime contractor, erector and painter to remove, collect and vacuum-extract the spent abrasive containing the tower's original lead-based paint and the

many layers of paint applied over the decades.

After sandblasting the original paint, Seaway applied a three-coat system of zinc primer, epoxy and a urethane finish, all while ensconced within the protective canvas walls wrapping the two-story platform. In the mid-1980s, Vlahakis said the Michigan Department of Transportation (MDOT) was one of the first in the country to originally implement this now common three-coat system capable of lasting approximately 35 years.

For the south tower, Seaway earned a national award from the Society for Protective Coatings (SSPC) for its "innovative containment system that allowed the cleaning and coating of the towers while maintaining traffic flow on the bridge," Vlahakis said. The system includes the platform's collection system and the continual vacuuming of spent abrasive to contain the debris.

SSPC's 2020 E. Crone Knoy Award "recognizes an outstanding achievement in industrial or commercial coatings work that demonstrate innovation, excellence in craftsmanship, or the use of state-of-the-art techniques or products to creatively solve problems or provide long-term service." This system clearly fits the bill.

The design nuances, the details and sheer logistics of the system's platforms and support systems earned Ruby + Associates a host of national, state and regional awards, including:

- 2020 National Council of Structural Engineers Association (NCSEA), Outstanding Project Award for Other Structures
- 2020 American Council of Engineering Companies (ACEC), Michigan Honorable Conceptor Award
- 2019 Structural Engineers Association of Illinois (SEAOI), Excellence in Structural Engineering, Best Neighboring State Project Award

"These multiple awards recognize the engineering knowledge and problem-solving creativity of the firms involved, evident from the excellent job they've done repainting the Mackinac Bridge towers," said the Mackinac Bridge Authority's (MBA) former Chief Bridge Engineer and current Executive Secretary Kim Nowack, PE, in an MBA press release for the NCSEA award. Nowack herself is ACEC's recipient of the 2021 Felix A. Anderson Image Award for positively affecting the public's understanding and appreciation of the engineering profession.

As the latest development in this evolving success story, Vlahakis said the management of the Golden Gate Bridge in San Francisco has expressed interest in tailoring the patented platform and containment system to work on the heights of this West Coast landmark.

A Bird's-Eye Overview: The Movable Platform

For Ruby + Associates, this innovative system called for not only engineering the platforms but problem-solving a host of engineering and erection details, including creating a support system for the movable platforms, using 3D modeling software for crane placement during platform installation, and navigating the difficulties of material transport on a worksite 552 feet above the Straits of Mackinac.

The towers and the project take vertical access to a whole new level. As part of the engineering assessment process, Ruby's project management team of Andrew Twarek, PE, SE and Myles Badour, PE traveled the tower interior – an experience as claustrophobic as the top of the tower is wide-open, windblown and exhilarating. Badour describes riding a small, three-person elevator, and for the last 40 vertical feet, climbing a series of ladders, squeezing through narrow hatchways and finally exiting the last hatchway at the very top of the tower. Standing on top of the world, the team enjoyed a bird's-eye view of the Straits of Mackinac and the forested expanse of Michigan's two peninsulas stretching into a blue and green infinity. "The view is quite spectacular," Twarek said after working on the pinnacle of this iconic bridge.

More than a magnificent view, the Ruby team had the opportunity to assess conditions both within and on top of the tower. The information helped the team to engineer outriggers at the top of the tower,

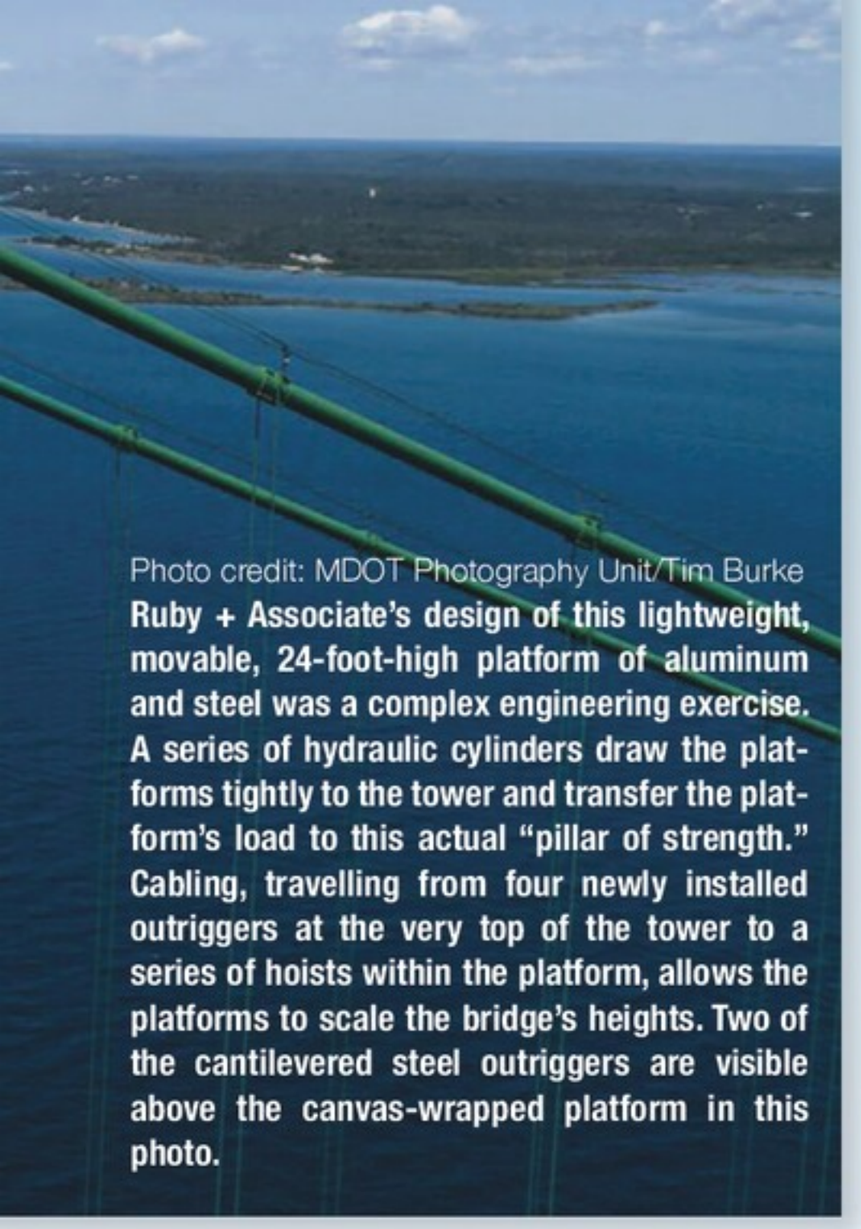


Photo credit: MDOT Photography Unit/Tim Burke

Ruby + Associate's design of this lightweight, movable, 24-foot-high platform of aluminum and steel was a complex engineering exercise. A series of hydraulic cylinders draw the platforms tightly to the tower and transfer the platform's load to this actual "pillar of strength." Cabling, travelling from four newly installed outriggers at the very top of the tower to a series of hoists within the platform, allows the platforms to scale the bridge's heights. Two of the cantilevered steel outriggers are visible above the canvas-wrapped platform in this photo.

along with determining the material transport of the outriggers' aluminum components and steel beams.

Bolted to the very top of the tower, the outriggers – one is a triangular aluminum structure and the other is formed of several cantilevered steel I beams – provide secure attachment points for the cabling system. The cables run from the outriggers to a series of air-powered Tractel hoists located both within and on the roof of each platform. Together, this system permits the platforms to scale the full length and height of the tower and struts.

To operate the system and specifically the upper hoists, the Seaway crew rode the rooftop of the platform, watching the cars shrink and the seagulls fly only slightly above their own three-level work "nest" of aluminum and steel. Imported from Germany, "these air-powered man-riding hoists are the biggest hoists one can buy," Vlahakis said. "These beautiful units raised the platforms to the next area that we had to clean and coat."

Fall arrest protection and a redundancy of safety cables on the hoist in the event of cable failure protected the crew. "We designed anchorage points so that Seaway could attach their personal fall arrest lifelines," Twarek said.

This amazing and complex project on the heights of the Mighty Mac showcases the capabilities of both firms. From the platform to the outrigger design and installation, Ruby + Associates was able to showcase the firm's multiple disciplines,

including erection engineering, construction engineering, heavy lift engineering, and steel and aluminum fabrication detailing services.

For Seaway Painting, the current project is a continuation of the company's established history of working with the Mackinac Bridge Authority. Having worked on the bridge at various times since 1996, Seaway Painting is familiar with virtually every rivet and every vertical inch of this signature structure. "Sometimes we were successful in our bid and sometimes we were not, but I can say that we have worked on the Mackinac Bridge more than any other painting contractor over the past few decades," Vlahakis said.

Seaway Painting has worked on Michigan bridges ranging from the Ambassador Bridge in Detroit to the Cut River Bridge in the Upper Peninsula, along with bridges on the East and West Coasts, including the San Francisco-Oakland Bay Bridge in California. Seaway's diverse portfolio includes maintenance painting for Michigan arenas, along with work for large automotive manufacturers and utility companies.

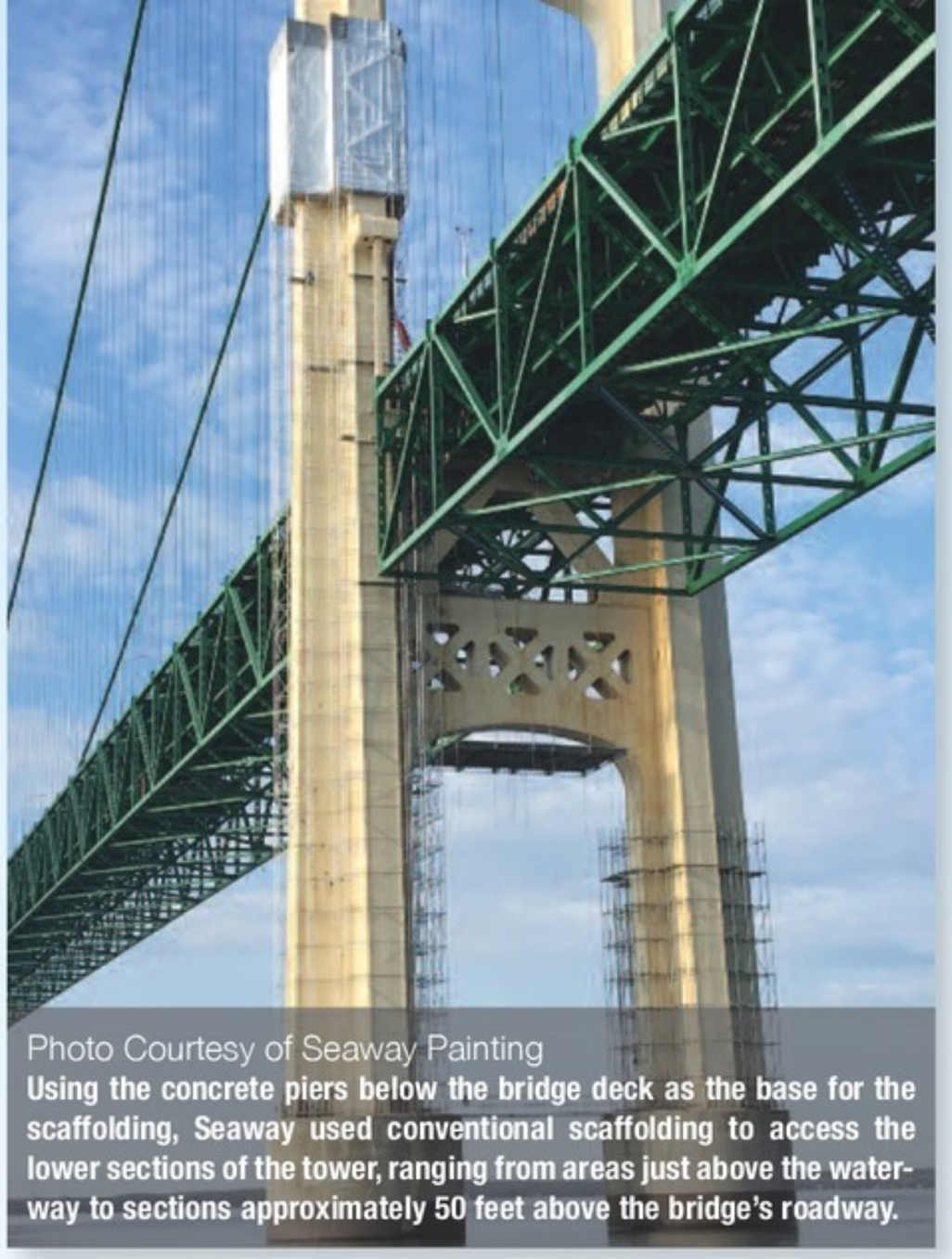


Photo Courtesy of Seaway Painting
Using the concrete piers below the bridge deck as the base for the scaffolding, Seaway used conventional scaffolding to access the lower sections of the tower, ranging from areas just above the waterway to sections approximately 50 feet above the bridge's roadway.

The Beginning Bidding Phase: A Problem and a Plan

Every bidder on the tower renovation faced a problem as monumental as the towers themselves. The bridge roadway is 200-some feet above the water, and the bridge rises approximately 320 feet from the roadway to the top of the towers. Using conventional scaffolding meant more than just building the system from the roadway to the full height of the tower. "They would have to use conventional scaffolding all the way from the piers (the concrete piers below the bridge deck supporting the tower legs)," Badour said. "The distance is about 550-some feet from the pier all the way up to the top of the tower. The amount of material alone just to scaffold that height, and in addition get across to the struts, would have been a significant undertaking."

As bid day approached, Vlahakis traveled to St. Ignace to view the model platform and miniature tower rising only a few feet from the

surface of Dan Halberg's kitchen table. "He showed me his model and I said, 'This is going to work,'" Vlahakis recalled. "And Halberg said, 'Steve, I *know* it's going to work.'"

The wheels of invention were set in motion: The Seaway duo drove 45 minutes to the Onaway offices of fabricator Moran Iron Works to discuss the model with Founder and Chief Executive Officer Tom Moran and his team. Vlahakis said the team also tapped the expertise of the Mackinac Bridge Authority's retired chief engineer Jim Ecker for his evaluation.

Moran Iron Works enlisted the services of Ruby + Associates to engineer the concept into a buildable, safe and structurally sound work platform. "It required significant effort and engineering, but the concept was alive (and viable)," Badour said.

According to Twarek, the original kitchen table model and concept called for encircling both legs of the entire bridge tower and providing a single platform with 100 feet of tarp enclosure for efficient painting. Ultimately, the concept proved too aspirational for production. As Ruby + Associates began the engineering, "we realized the weight of the originally conceived platform was too significant, and we generated ideas to break it up into two separate platforms," said Badour.

After Seaway secured the first MDOT contract for the north tower in 2017, Ruby + Associates began engineering the intricate details of the platform and outrigger systems, while Seaway launched a portion of the cleaning, coating and painting of the tower interior and areas below the roadway deck.

Seaway used conventional scaffolding in this early phase of the project to sandblast and to apply the three-coat system in these more accessible areas. "We worked from the waterway to about 50 feet above the roadway using conventional scaffolding, and using the concrete piers below the bridge deck as the base for the scaffolding," Vlahakis said.

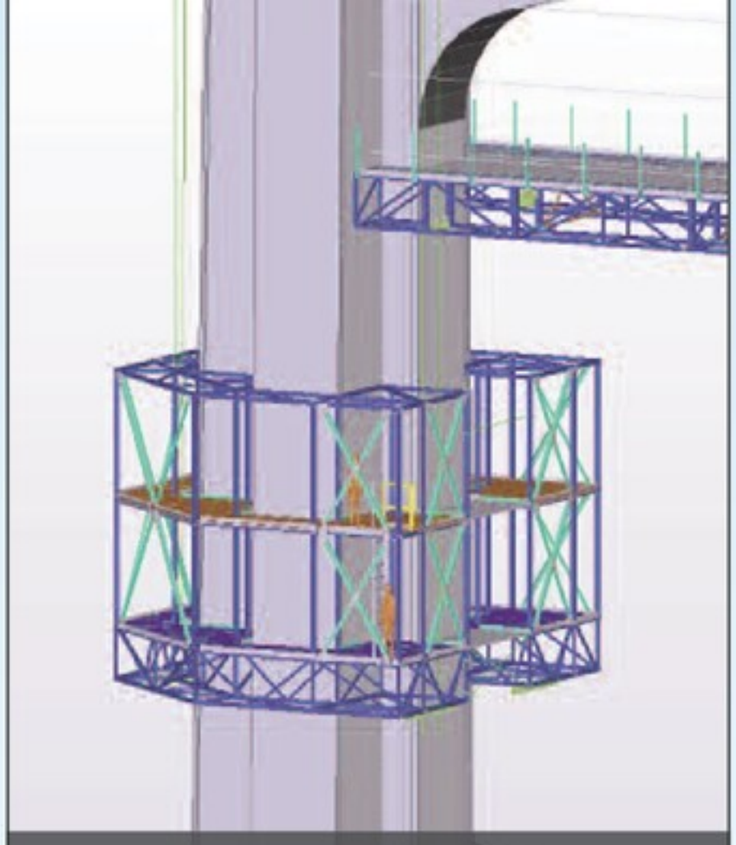
Design: Weighing the Design of a New Platform Concept

While Seaway worked below the bridge roadway, Ruby engineered the new platforms for use above the roadway. The originally conceived platform was separated into a tower leg platform and a tower strut platform. To lighten the load even further, each of the two platforms was subdivided into different segments.

The leg platform was segmented into two C-shaped sections due to weight constraints on the size of crane allowed on the bridge. During the install, Ruby specified a modest 35-ton crane to hoist each segment into position on the tower leg before bolting the halves together to form one unit.

The strut platform is designed as two different boxes to be positioned on opposite sides of the strut. Ruby's design of a hinged sway frame – perfected with some creative fabrication by Moran Iron Works – allows the strut to be reconfigured in mid-air to access the

Photo credit: Moran Iron Works
Weight restrictions on the bridge called for the use of a modest-sized 35-ton crane to lift each segment of the platform into place. Due to the crane size and weight constraints, the platforms are not only assembled in segments but built of four-foot-deep steel box trusses at the base and an aluminum superstructure above the box truss.



Tekla Model Image: Ruby + Associates, Inc.
Ruby + Associates engineered and Moran Iron Works fabricated the two platforms to access the north and south towers of the Mackinac Bridge: a roughly C-shaped, segmented platform designed to travel the towers' soaring vertical pillars or "legs" and a horizontal, segmented platform to span the three horizontal struts between the pillars.

underside of the strut and to bypass the strut as it scales the tower.

Twarek explains: "Each box can individually go both up and down and across the strut. They could move as individual pieces, basically, but once the platforms were underneath a strut and the team was ready to paint, there was a little swing-out, sway frame that would attach the two boxes together and join them into a rectangle. They would then fill in any blank area underneath with some additional aluminum planks."

The tower leg platforms are a hybrid of aluminum and steel due to weight constraints as well. "Both platforms have four-foot-deep steel box trusses at the base and an aluminum superstructure above the box truss," Badour said. Each platform has three working levels: the top of the box truss, a second-level placed 10 feet above the box truss, and the roof of the structure.

The hoists limited the weight of the platforms as well. "We used four hoists in the leg platform and two in the strut, because each hoist had a limited capacity," Badour said. "We had to make sure the structural weight of the platform, including what we call live loads, was under the capacity of the hoists."

The hoists, however, offered significant advantages. Early in the project, Ruby considered using heavy winches, but the winches might have required attaching the cables to the concrete piers below the bridge deck. "We would have had to align multiple parts for 550 feet and manage 2,000 feet of cable," Badour said. "Seaway used the hoists on previous jobs, and the hoists are very reliable and do not require a great deal of cable other than what is needed to go from point A to point B."

Beyond weight, the tower's taper of about five-and-a-half-feet from the roadway to the top of the bridge called for another set of measures. For design and fabrication, the taper called for precise field measurements of the bridge. "They couldn't just rely on bridge drawings from the 1950s," Vlahakis said. "Ruby and Moran had to take extensive field measurements, because the platform that encircles the tower legs has to be tight enough to the bridge." During actual operation, a system of aluminum planks can be added or subtracted to manage the taper as the platform scales the height of the tower.

Outrigger Design and Installation: Building a Mini-Mac on Top of the Bridge

Weight was a consideration in the design and installation of the aluminum outrigger. "Aluminum is three times lighter than steel and has a pretty high strength-to-weight ratio," Badour said.

The material's lightness helped the Seaway crew haul the aluminum sections – six foot six inches in length or less – up the tower's internal elevator and its narrow labyrinth of ladders and hatchways.

According to Badour, "the team had to thread the beams through these narrow openings within the tower, and once on top, they had to hit the tower's existing rivet patterns to fasten the outrigger system to the top of the tower."

Once installed, "ironically, the aluminum outrigger mimics a cable-stay bridge," Badour said. Resembling a mini-Mackinac Bridge but with only one central "tower," the outrigger forms a triangle of aluminum. The triangular configuration – the triangle being a highly stable structural form – strengthens the outrigger assembly, while the aluminum lightens its weight.

Outrigger Design and Installation: Fishing for Steel on the Straits

The system's steel outriggers presented an even greater degree of difficulty. Bolted to the side of the top of the tower, the steel outriggers extend straight out over the water "probably about 10 feet or so," Vlahakis said.

"In this case, we couldn't use aluminum due to the type of loading as the two steel members are essentially cantilever beams," Badour explained. "Plus, they don't make aluminum shapes to the needed depth. The steel beams used were 18x35s, and they weighed around 500 pounds each. We helped to develop a plan to transport the steel beams to the tower."

Seaway transported a Tractel electric hoist to the very top of the tower, again making use of the tower's elevator and ladders. Seaway carried aluminum beams up the tower to assemble what the Ruby team calls the "fishing pole," while the "fishing line" was the cabling used to hoist the steel beams.

"It took about 25 minutes to hoist the steel and heavy equipment to the top," Vlahakis said. To attach the actual steel outriggers, the Seaway crew worked in spider baskets, removing a few rivets from the 1950s tower and bolting the steel beams to the side of the tower near the top of the tower.

Design: Managing the Wind

The outriggers form a secure attachment point but the actual load of the platform is transmitted to the tower leg or the struts in the case of the strut platform. Ruby's design makes use of hydraulic cylinders to draw the platforms tight to the tower. "The hydraulic cylinders resemble bumpers pushing against the bridge, one pushing on one side and another pushing on the opposite side to lock it into place," Twarek said. "The hydraulic cylinders help the leg platform hug the tower and grab on tightly to resist wind load instead of being loose and bouncing against it. The hydraulic cylinders are then able to retract to allow the platform to move up and down."

Ruby designed the system to withstand a maximum anticipated wind speed of 100 miles per hour. According to Twarek, the prescribed wind load is based on the Mackinac Bridge Authority's historical data and its continually operating anemometers, as well as the codes of the American Society of Civil Engineers (ASCE).

Different activities were calibrated to different wind speeds. "When the platform

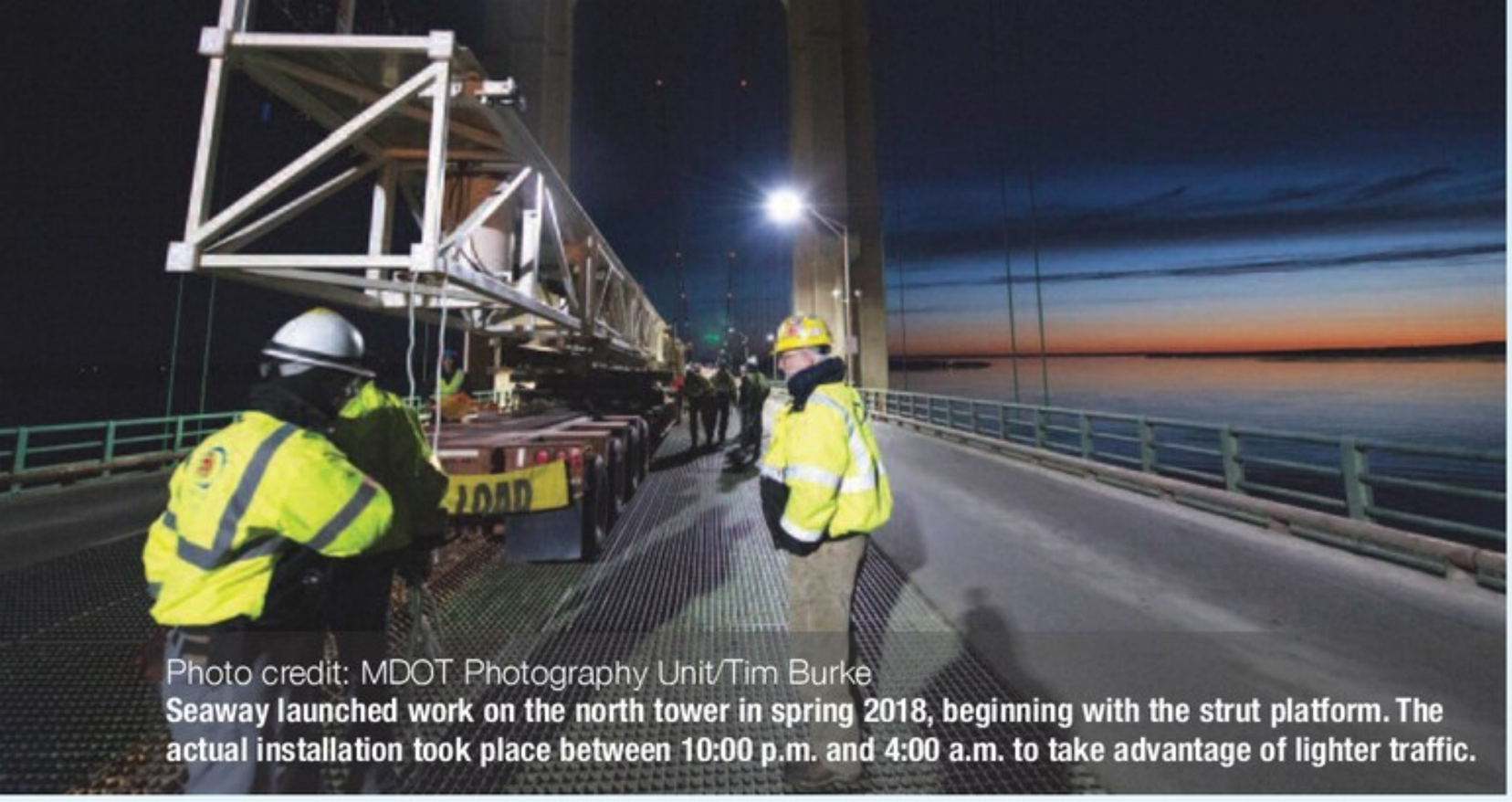


Photo credit: MDOT Photography Unit/Tim Burke
Seaway launched work on the north tower in spring 2018, beginning with the strut platform. The actual installation took place between 10:00 p.m. and 4:00 a.m. to take advantage of lighter traffic.

is actually moving, the criterion is a wind speed of approximately 40 miles an hour," Twarek said. "We set a maximum wind speed of 60 miles an hour during blasting because to blast they have to have the platform fully enclosed and the tarps tied off."

Platform Assembly: A Week on the Beach

For most Michiganders, the towers of the Mackinac Bridge are a gateway to summer vacation or hunting camp in the fall. For the team, the bridge marked the launch of several seasons of challenging but rewarding work filled with the satisfaction of preserving this landmark structure.

Under the direction of Moran's Project Manager Tyler James, Moran fabricated the platform components and shipped the steel and aluminum members on a flat bed truck from Onaway to the beach of the Mackinac Bridge Authority's yard in St. Ignace. Seaway's four-person crew spent about a week on the beach assembling the platform segments from the drawings.

Strut Platform Installation: Working the Midnight Shift on the Mighty Mac

Seaway launched work on the north tower in spring 2018, beginning with the strut platform. The actual installation took place between 10:00 p.m. and 4:00 a.m. to take advantage of lighter traffic. "We shut the bridge down at 15-minute intervals during those hours," Vlahakis said. "There wasn't a lot of traffic, but if traffic built up on one side, the bridge authority would let cars cross the bridge. We did have to close the bridge at some point until the platform was in place and secured."

Seaway's six-person crew worked closely with the Mackinac Bridge Authority, Ruby + Associates and Moran Iron Works throughout the installation process. The day before the platforms arrived on the bridge, the team installed the cables, attaching the line to the four outriggers. At night, half of the strut platform was transported from the Mackinac Bridge Authority's yard on Moran's semi-trailer, a vehicle equipped with a turntable capable of swiveling the platform into position for the crane lift.

The crane operator had already positioned the 35-ton crane behind the truck at a location calculated for lifting the platform. Under the glow of the bridge's night lights, the team drove back to the Mackinac Bridge Authority's yard in St. Ignace and loaded the other half of the strut platform on the semi-trailer, repeating the same process until the entire platform was in place and secured in the early morning hours.

Once installed, "the platform could be raised up to blast, coat and paint the second and third struts while traffic was flowing underneath it," Vlahakis said. "We had a net installed underneath the platform in case somebody dropped a bolt or tool, but we were always very careful."

Leg Platform Installation: A 35-Ton Crane and a Steel Nest

For installation of both the strut and leg platforms, the use of the 35-ton crane met the bridge's weight restrictions but limited the crane's reach and other capabilities. "We couldn't dip out very far with the crane boom," Twarek said. "We had to keep the crane close, meaning we had to lift half of the platform basically straight up and rotate it around."

Ruby used 3D modeling software to plan the crane placement. "In our detailing and our 3D modeling software, we generated a small model of the crane," Twarek said. "We were then able to manipulate and rotate the model, along with making sure it would be clear of the bridge tower, the bridge strut and even the light poles on the bridge."

For the leg platform installation, Moran backed the semi-trailer in towards the tower leg and swiveled the platform into the best position for the crane lift of the first C-shaped segment. The crane operator then lifted this half of the platform to a temporary steel shelf dubbed the "nest." Twarek describes the process: "The truck pulled up with a C-shaped half of a tower leg platform, and the crane would lift and place it on temporary steel beams bolted to the tower leg about 20 feet above the bridge roadway. The crane would then erect the other C-shaped half of the tower leg platform. Essentially, the crane installed half of the platform at a time, and then the two halves would then be bolted together around the tower."

A 'Round-the-Clock Operation

After this intricate access system was in place, Seaway worked throughout the spring, summer and fall of 2018 on the north tower, followed by work on the south tower beginning in 2019. Seaway will complete the south tower in August 2021.

Seaway worked seven days a week, almost 24 hours a day in two 10-hour shifts from mid-April to mid-October. Seaway moved the platforms in the day, using a two-person crew to operate the hoists for the strut platform and a four-person crew for the tower leg platform. Overall, Seaway painted by day and blasted by night to strip the steel tower down to bare metal.

Work flow during the weekday remained unimpeded, but Seaway contended with lane closures and heavy weekend traffic during the height of tourist season. "On Fridays, we would lose the northbound lanes and on Sundays we would lose the southbound lanes," Vlahakis said. "If there were 700 cars or more per hour, we even had to remove any of our equipment from the bridge and the whole operation stopped.

"We developed backup plans for these times," Vlahakis said. "We put our paint equipment underneath the bridge, and on anticipated heavy traffic days, we would either paint underneath the bridge or do caulking operations, but we continued to work seven days a week."

A Three-Coat System

The sandblasting and painting were conducted within the canvas-covered platform enclosures. Vlahakis describes the process: "The structural steel had to be blast-cleaned to an SSPC-SP 10 standard for old paint removal. Removing the paint to this standard improves the adherence of the zinc coat to the structural steel."

Collaborate. Innovate. Eliminate.

Three steps to successful outcomes on commercial reroof projects with existing lightning protection systems.

Collaboration

Beginning as a phone call between a roofing professional and a lightning protection systems specialist, a **"roof walk" audit** addresses **removal, storage, reinstallation,** and any **system redesign.** System redesign may be warranted when new or enhanced requirements surpass the system's capacity.

As too many roofers have experienced, removal and reinstallation are rarely straightforward. The addition of specialized, system-specific knowledge helps ensure you return the reinstalled system to optimal performance.

This is a critical distinction.

Installation does not culminate with the system atop the reroof. **Installation concludes when the system is returned to its optimized scope of protection.** Many project partners now demand the best practice of phased project coordination to maximize the property's time under protection.

Roofing professionals choosing to collaborate with a lightning protection system specialist elect the efficient delivery method for modern commercial reroofs. Quality, suitability to operations, and potentially

significant savings to schedule and budget are advantages of the method.

Seeing the roof together, at the outset of the project, illuminates unknowns regarding the existing lightning protection system and its dependent systems, virtually the entirety of electronic infrastructure. This foreknowledge is to the roofer's advantage. Its insights can also be shared with the property owner and play an important role in the management of reasonable expectations for the reroofed property.

Innovation

Innovation is the natural byproduct of collaboration. **Innovation goes beyond the "big three"—NFPA 780, UL 96A and LPI 175.** It extends to property operations and unique local and municipal compliance.

Connectivity crowns content. Even when the term "connectivity" isn't being used, connectivity within electronic infrastructure is a priority concern for almost every property and project owner.

Failure to properly remove, store and reinstall the appropriate lightning protection system endangers connectivity within the structure and its operations, inviting a buffet of liability and other potentially negative outcomes.

Eliminate

Innovation that results from collaboration between a roofing professional and a lightning protection specialist can eliminate a variety of budget and schedule-killing pitfalls. **The delivery method also accounts for system inspection and certification.**

There is liability in "just doing it."

Improperly and inadequately integrated lightning protection systems can be made ineffective or altogether useless.

Working closely with roofers, consultants, facilities and property management, and general contractors, Novi, Michigan's Guardian President Phil Youtsey relies on nearly three decades as a system specialist to illuminate the unknowns.

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GUARDIAN

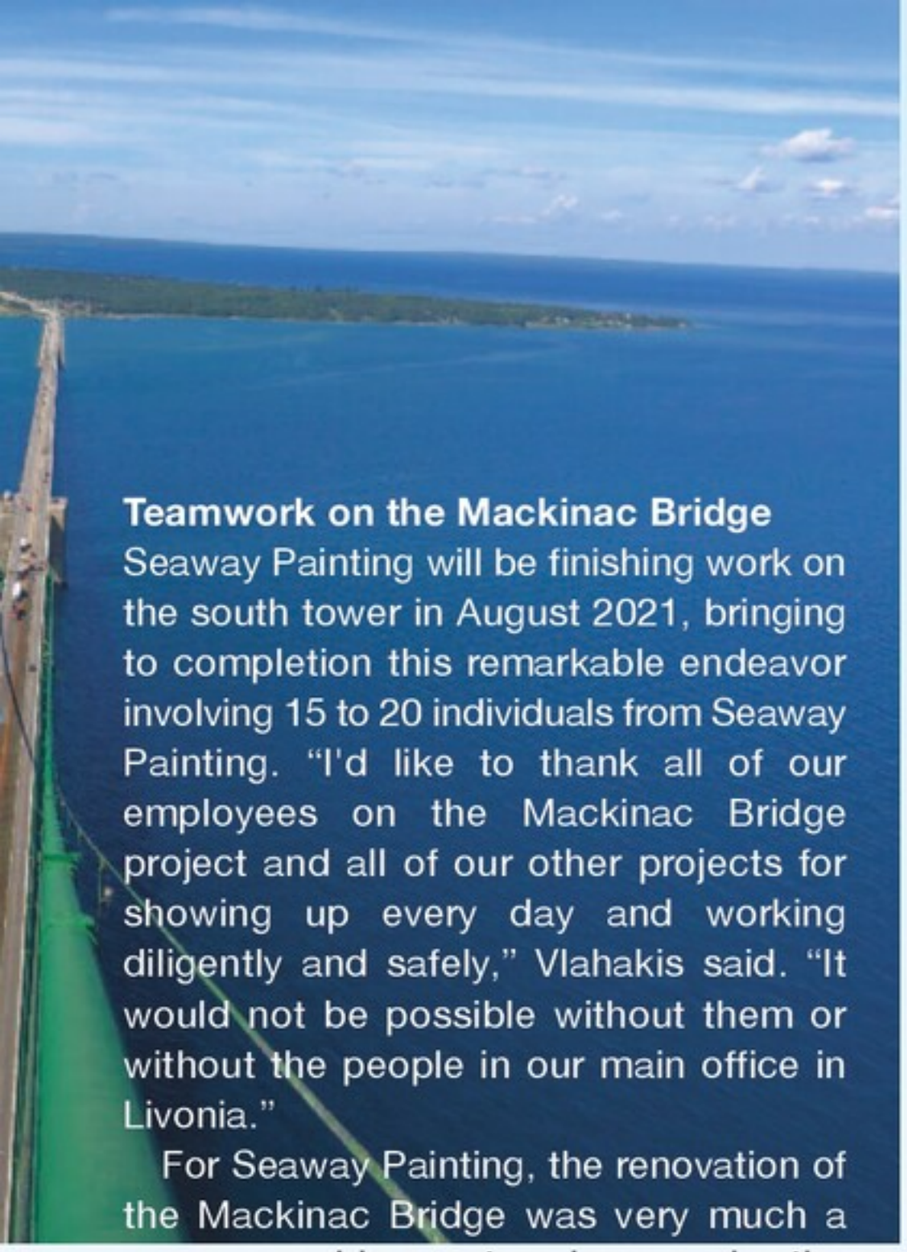
Lightning protection above and beyond.

Photo Credit: Ruby + Associates, Inc.

The aluminum outriggers (upper to mid-left), installed at the top of the tower, resemble a cable-stay or even a mini-Mackinac bridge. Complicating outrigger installation but offering a mind-blowing view, access to the top called for a ride up a small three-person elevator, followed by a 40-foot climb up a series of ladders and through narrow hatchways to reach the very top of Michigan's Mighty Mac.

The spent abrasive fell through the open grates of the platform's second level and the top of the box-truss into a collection system within the truss level. To avoid adding extra weight to the platform and to contain the original lead paint, Seaway continually vacuumed and removed the spent abrasive with the aid of a large vacuum truck.

The three-coat system has to be applied in a specified sequence and timeline. "We had to apply the zinc primer within eight hours of blasting," Vlahakis said, "and then we had to wait an entire day before applying the epoxy coat and caulking all the seams. We then placed the urethane as the finish coat of this three-coat system." A company based in St. Louis, Missouri, called Carboline Coatings was the coating material supplier.



Teamwork on the Mackinac Bridge

Seaway Painting will be finishing work on the south tower in August 2021, bringing to completion this remarkable endeavor involving 15 to 20 individuals from Seaway Painting. "I'd like to thank all of our employees on the Mackinac Bridge project and all of our other projects for showing up every day and working diligently and safely," Vlahakis said. "It would not be possible without them or without the people in our main office in Livonia."

For Seaway Painting, the renovation of the Mackinac Bridge was very much a company-wide enterprise and the company itself is very much a family affair. Founded by Steve Vlahakis' father in 1964, Seaway Painting remains a vibrant family-owned and operated business. "My father and mother are still involved in the company, and both come into the office every day," said Vlahakis who owns the company along with his sister, Irene Zannis. The company benefits from the active participation of her husband and Vlahakis' own son Nico Vlahakis.

Ruby + Associates, also a family-owned business, was founded in 1984 by David Ruby, PE, SE. Today, the firm is a certified Women's Business Enterprise (WBE) led by President and CEO Tricia Ruby, who took over leadership of her father's business officially in 2011. Tricia Ruby is a proud CAM Board Member dedicated to serving the industry.

The project team worked in the same collaborative spirit to preserve this beauty of a bridge. "It was a joint effort between Moran, Ruby and Seaway," said Vlahakis of this multi-year undertaking.

The award-winning project is a tribute to the Mackinac Bridge Authority, the fabrication skills of Moran Iron Works, the engineering abilities of Ruby + Associates, and the expertise of Seaway Painting.

The Mackinac Bridge Authority, and most likely the four million drivers annually crossing this five-mile span, can thank the entire team for a difficult job well done. At the SEAOI award ceremony, the Mackinac Bridge Authority's Kim Nowack thanked the team "for their work preserving this infrastructure icon."