

# BrandSafway's SafRise Climber® Clinches Historic Renovation

A custom-engineered solution provides safe access to the front, top and back of a historic downtown landmark.

Many of the unique qualities of older buildings, cherished across generations, can also cause major headaches when it's time for renovation. This was the case when JP Cullen was asked to renovate the exterior of Milwaukee's City Hall.

Built in 1895, this national landmark stands 353 feet high — the tallest office building in the world at the time of construction — and presented numerous challenges during the renovation. From its inconsistent vaulted spaces below ground, all the way up to its steep copper roof, this access project was as tough as they get. It only got tougher with freezing weather, a dense urban work environment (sidewalks alongside the building had to stay open) and 19th century engineering specifications (or, more precisely, the lack thereof).

In describing the job, BrandSafway Branch Manager Andy Virnich commented, "This project was one difficult challenge after another. Fortunately, this is the kind of challenge we thrive on."

JP Cullen was charged with the replacement of heavy terra-cotta cap pieces along the top edges of all gables, dormers and finials in various locations. This meant Cullen needed

access to the front, top and back sides of the gables and dormers at the same time. With building setbacks (steps inward) as much as 13 feet, a traditional mast climber wouldn't work. Cullen met with BrandSafway to discuss the project requirements.

## SafRise Climber® meets the challenge

Ultimately, BrandSafway was awarded the contract to provide a modified version of its motorized SafRise Mast Climber for the job, on the basis of BrandSafway's reputation as a leader in engineered solutions for complex access situations with a steadfast focus on safety. "It was great working with BrandSafway," said Chris Hastings, JP Cullen's project manager on the job. "The project flowed very well for us."

SafRise offers an unprecedented level of safety. While other platforms may leave workers stranded in an emergency, SafRise will descend in a controlled manner in the event of a power failure or if the system detects an excessively rapid descent.

SafRise also offers the highest speed-to-capacity ratio on the market. The standard configuration can move up to 8,000 pounds on



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➤ a 50-foot-wide platform at 30 feet per minute. BrandSafway collaborated with Hydro Mobile, the designer and manufacturer of SafRise equipment, to develop a multifaceted solution for JP Cullen with ironclad safety, unprecedented worker productivity and all the unique features of the standard SafRise Mast Climber.

The custom-engineered solution included a forward extension that created walkways with guardrails that cantilevered toward the building from the mast climbing work platform (MCWP). The extension locked onto a rail system bolted to the MCWP in such a way that it could be winched up, drawbridge-style. While the extension was up, the MCWP could be raised or lowered. At the

## Shoring design proves critical

Some of the SafRise machines imposed downward forces exceeding 38,000 pounds. So long before the fancy extensions were built, BrandSafway engineers had to consider what the equipment was resting on. There was a basement area under much of the sidewalk on which the climbers rested. Because the vaulted areas under each mast climber involved different spatial and structural configurations, a unique shoring design was required for each mast climber.

It was critical that the basement shoring be placed precisely under the canopy legs above the sidewalk in order to ensure the loads were transferred properly. To locate the positions in



*The wedge anchors allowed the erectors to continue building upward while the epoxy anchors cured.*

appropriate height, the extension could be rolled sideways along the length of the platform to the needed position. Once in position, the extension was then lowered to horizontal with a manual winch. To complete the system, two additional hook-on platforms were attached, one at the end of the extension reaching behind the gable and one continuing in front. This allowed one worker to stand safely on each side of the cap unit to lift and replace the heavy pieces of terra-cotta. There was also an extension added to the back of the MCWP to allow for a portable toilet and a full-size job box.

“The modified mast climbers were specifically adapted for the City Hall project,” said Hastings, “and they provided exactly what we needed to get access to those difficult areas.”

the basement, the building exterior was digitally scanned. A surveyor then used the scan data and expert trigonometry to transfer key points into the building, down the stairs and into the basement areas.

Even the soil below the basement floor was a challenge: Milwaukee City Hall was built on a swamp, so the soil’s load-bearing capacity varies widely. Due to this, worst-case conditions of 500 psf had to be assumed.

“Every single shoring location was different,” noted Eileen McEnroe Hanks of GRAEF, the engineer of record for the attachments to the building. “BrandSafway worked with us to use their shoring systems and readily available materials to create a unique solution for each case.”

➤ **The project began in January and was completed in November of the same year with no safety incidents.**



### **Innovative tying technique required**

Anchoring the masts was yet another huge challenge. The exterior of Milwaukee's City Hall is a hard kiln-fired brick material. The inner wythes, however, are relatively soft cream city brick. Pull testing with a custom-designed tool showed standard wedge-type anchors did meet installation load requirements but could not meet the operational load requisite for the mast. The solution required  $\frac{3}{4}$ -inch-diameter stainless steel threaded rods embedded 13 inches into the wall and held in place with a two-part epoxy.

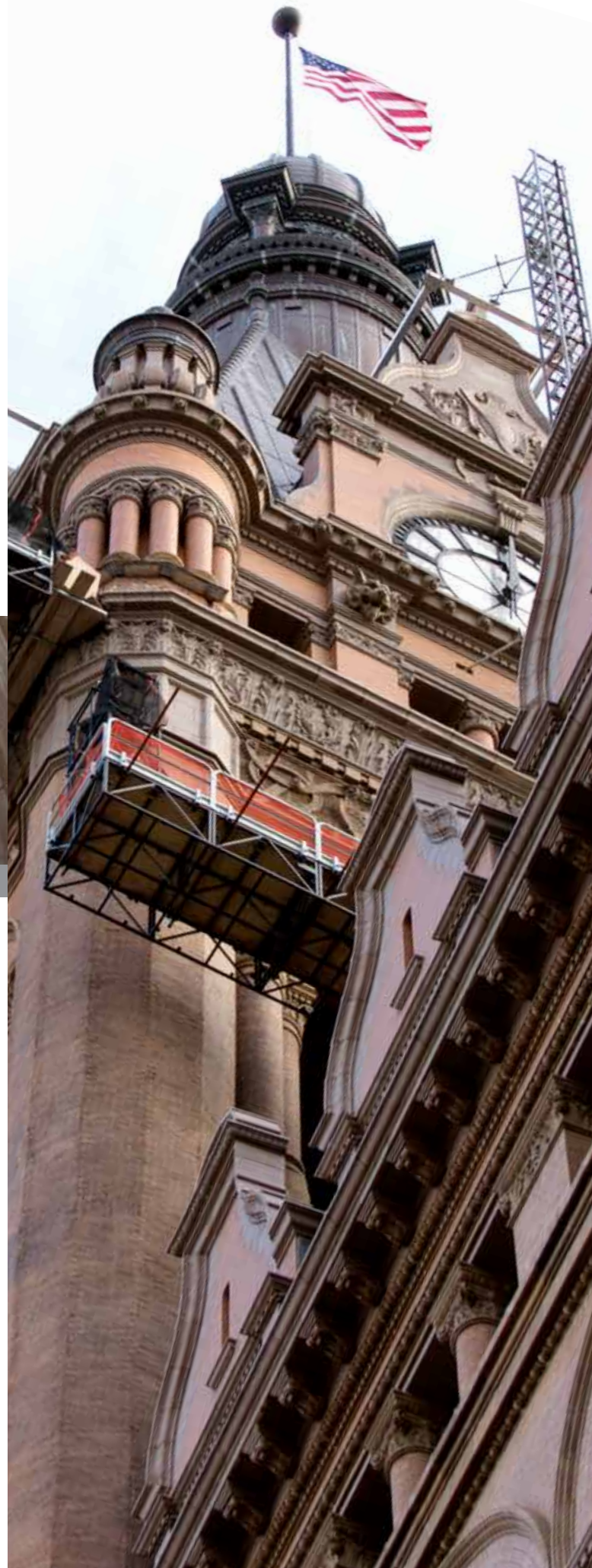
This would have been fairly straightforward if the air temperatures at the time hadn't been well below zero. Even the epoxy manufacturer had no set strength values for temperatures that cold. So BrandSafway, with the support of the field engineer for the epoxy manufacturer, Hilti, determined that sufficient anchor strength developed after a four-hour cure time. After the designated cure time, the epoxy anchors were tightened, and the system was

again pull tested to ensure it met the operational load requirements.

Beyond that, the building configuration itself presented another mast-tie challenge. Holes could not be drilled through decorative terra-cotta façade panels located at the floor levels. This required the ties to be attached either above or below the floors. However, there were windows in these areas. So, to create attachment points, custom lightweight beams — some 20 feet long — were fabricated and spanned across the windows, then bolted to the wall surfaces on the sides of the windows.

### **Complication at the top**

Finally, tying the mast to the building at its very top presented the most extreme challenge. Cullen needed to replace finials atop the peaks of the gables of the building's clock tower. This required the MCWP to travel to this elevation. However no ties could be installed to support the mast as the front face of the entire gable was covered with decorative terra-cotta panels. The steeple roof over





› the clock tower rose behind the gable; clad in copper, it could not be drilled. The only possible way to tie the top end of the mast back to the building was through a 19-by-32-inch hatch opening above and slightly off-center of each gable ridge. However, no welding or bolting to the clock tower's internal structure was allowed.

The solution, created with the help of GRAEF, was to clamp and cable an elaborate steel support system inside the tower so that a 12-by-6-inch steel receiver tube was aligned with the hatch opening. A 10-foot-long aluminum tie structure was designed and fabricated to fit into the hatch from the outside. These structures were hoisted by crane and then slid over, and bolted onto, the steel receiver mounted in the hatch opening. The cantilevered portion of the tie structure extended out of the building and encircled the top of the finial without touching the exterior of the building. It included a horizontal member in front of the gable face, to which the mast could then be tied.

All this was complicated enough. But on installation day, with the part suspended 300 feet in the air by a crane that was blocking traffic, the crew discovered a fabrication error. The part could not be mated with the receiver as planned.

“At this point it was 7 p.m. and there was no turning back,” Virnich recalled. “I was in the clock tower discussing possible solutions with the team. I called GRAEF and was impressed at how quickly they developed a field modification and verified it with a structural analysis. The crew was then able to make the mod and proceed with the installation. We wrapped up in about an hour. GRAEF was a key partner throughout the project.”

Hastings summed up his impression of BrandSafway. “We worked great with BrandSafway’s field and management staff,” he said. “Their system really worked out well for us. Working with BrandSafway was a great experience, and I look forward to working with them again. Their whole team was extremely talented.”

BrandSafway’s Virnich offered his final thoughts on the project: “Just as the Milwaukee City Hall building stands as a testament to cutting edge architecture for its time, this project stands as an example of BrandSafway’s unique ability to solve the most difficult access challenges while keeping safety as the top priority. We’re extremely proud to contribute to preserving part of Milwaukee’s architectural heritage.” ◀



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