

Restoring Miami's Brickell Key Bridge

MAPEI products help maintain access to exclusive island paradise

by Roger Pratt, CRS Product Manager



Because MAPEI has helped to successfully complete hundreds of structural and patching repairs on bridges across the Americas, it was expected that MAPEI products would provide superior results once again. MAPEI's concrete restoration products played a key role in effectively repairing and resurfacing the Brickell Key Bridge's deck – substantially increasing its service life and ongoing accessibility to the highly distinguished community of Brickell Key.

Located in the heart of downtown Miami, Florida, and spanning 812 feet (247 m), the Brickell Key Bridge provides the sole gateway to a unique triangular-shaped, 44-acre (0,18-km²) island, renowned by locals as a “private little paradise.” Surrounded by sparkling clear water and featuring unobstructed views, Brickell Key living is tranquil, scenic and convenient. Just a hop from the booming financial district, this upscale, luxurious community is ideally situated – only 5 minutes

from the Port of Miami, 15 minutes from the Miami International Airport, and 15 minutes to Miami Beach.

Repairing the aged, concrete Brickell Key Bridge and restoring it to tip-top shape were recent priorities for the municipal government. With the aid of \$2 million in federal funds via the American Recovery and Reinvestment Act, The City of Miami began an immediate rehabilitation program that began with an engineering assessment.

Having successfully specified MAPEI products in the past, the project engineer expected a superior outcome once again. As a result, MAPEI's concrete restoration products played a key role in quickly and effectively repairing the Brickell Key Bridge – substantially increasing its service life and ongoing accessibility to this highly distinguished community.



Refurbishing rebar

1 Work on the Brickell Key Bridge began with routine surface preparation that involved removing deteriorated concrete to provide a sound substrate. During the abrasive blasting phase, installers found further deterioration in several areas of the concrete structure. Before additional repair products could be placed, all exposed rebar would require immediate remediation.

In order to repair, coat and protect the rebar effectively, MAPEI's **Planibond® 3C** epoxy modified cementitious anticorrosion coating was utilized. This three-component, solvent-free, moisture-tolerant system was applied on all exposed reinforcing steel in the bridge's columns, pile caps and deck to provide long-term corrosion protection. The applicator-friendly system can be applied using a brush or hopper spray equipment.

Multiple spalls – one-product solution

The Brickell Key Bridge deck, after enduring many years of heavy vehicular traffic and continuous exposure to a harsh saltwater environment, was in dire need of repair.

2 The opportunity to fix multiple spalled areas on a horizontal bridge deck application was easily met with fast-setting **Planitop® 18** flowable repair mortar.

3 One-component, user-friendly **Planitop 18** proved highly versatile because it offers application potential from 1/2" (12 mm) to full depth. Its superior resistance to abrasion, along with excellent compressive and flexural strength, will certainly help sustain the service life of this bridge deck over the long term. And because **Planitop 18** offers such a low coulomb rating (low permeability to chlorides), it helps guard against extreme, saltwater environments. Designed for fast-track turnaround, this rapid-setting repair mortar allows vehicular traffic to resume in just 1 hour.





Hard-to-reach repairs

4 A variety of repairs was made to the underside of the bridge's deck, beams and column caps. To address these vertical and overhead repair needs, MAPEI's **Planitop XS** ultra versatile, extended-working-time repair mortar was relied upon. Because highly sculptable **Planitop XS** is developed with outstanding workability, it was easily hand-applied to treat smaller defects on concrete surfaces such as voids, honeycombs and cavities from featheredge up to 4" (10 cm) thick. And in areas requiring large quantities of material, like the underside of the deck, **Planitop XS** was easily spray-applied.

Fiber-reinforced repair solution **Planitop XS** offers tenacious adhesion to existing concrete as well as the outstanding compressive and flexural strength so vital in a bridge repair application. Like its repair partners, it also contains a corrosion inhibitor to help protect against chloride ion permeability from water below.

When it came to repairing the pile caps, the project engineer preferred a form-and-pour product that could be pumped, due to the difficulty in using spray equipment in confined areas. One-component, form-and-pour **Planitop 15** was chosen to address this repair need. Adding water to **Planitop 15** creates a fluid consistency that is perfect for pumping into formed pile caps.

Not only did **Planitop 15** provide the ideal flowability that the contractor desired, but it assured the engineer that the mortar would achieve the high early strength specified. Fiber-reinforced **Planitop 15** offers excellent compressive and flexural strength, as well as a very low coulomb rating, which will help protect concrete against chloride ion attack.

Planitop 15 at a glance

One-component, form-and-pour repair mortar

- Fiber-reinforced, flowable material
- Suitable for form-and-pump as well as form-and-pour repairs
- Excellent compressive and flexural strength
- "Very low" coulomb rating
- Can be placed from 3/8" to 2" (10 mm to 5 cm) thick
- Ideal for overhead and vertical repairs exposed to extreme environments
 - Provides excellent adhesion to existing concrete surfaces
 - Enhanced with corrosion inhibitor
 - LEED-compliant





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History of Brickell Key

The history of Brickell Key can be traced back to 1896 when Henry Flagler had a channel 9 feet deep (2,74 m) dug from the mouth of the Miami River. In the process, Mr. Flagler created an off-shore property composed of two small islands. In 1943, Edward Claughton Sr. acquired the islands of Brickell Key and eventually purchased additional bay bottom land to combine them into a 44-acre (0,18-km²), triangular-shaped tract, separated from the mansions of Miami's fashionable Brickell Avenue by several hundred feet (meters) of water.

In the late 1970s, Swire Properties purchased most of the island property from the Claughtons and began to put into place a master plan that would ultimately transform it into one of the world's most unique island communities. In recent years, the Brickell Key area has caught the eye of the international business community. The lure of waterfront property and cosmopolitan flare has spurred considerable development and elaborate future plans for this distinctive model of luxury living.

Bridge deck resurfacing – the final step

5 With renovation to the underside of the bridge completed and all of the columns, beams and caps repaired, work could now focus on bringing the Brickell Key Bridge deck “back to life.” After the deck was shotblasted to a profile of CSP 5, two coats of **Planiseal™ Traffic Coat** epoxy overlay – each with a broadcast “black beauty” aggregate – produced a 3/8" (10 mm) system that easily met the project specification for exceptional, long-term durability.

Applied as a two-part epoxy system, moisture-tolerant **Planiseal Traffic Coat** functions as an exceptional waterproofing overlay and extremely durable, skid-resistant membrane solution. The addition of “black beauty” aggregate not only created a highly attractive finish, but effectively complemented this highly impermeable system that is capable of arresting carbonation and penetration of chloride ions

into the concrete deck. Ultimately, MAPEI's fast-curing **Planiseal Traffic Coat** system well exceeded the federal specification for coefficient of friction, and is expected to significantly increase the life of the Brickell Key Bridge deck for many decades to come.

MAPEI partners

Owner: City of Miami
Work: Repair, coat and protect rebar; repair spalled sections on bridge deck; make vertical and overhead repairs to bridge deck, beams and column caps; repair pile caps using form-and-pour method; and resurface bridge deck
Year: 2010-2011
Engineer: Metric Engineering, Miami, FL
Contractor: Fibrwrap Construction, Ontario, California
MAPEI Distributors: Construction Materials, Riviera Beach, FL; White Cap Construction Supply, Pompano Beach, FL; and E&E Construction Supply, Boca Raton, FL
MAPEI Coordinator: Steve Bradway

Planiseal Traffic Coat: at a glance

Fast-curing epoxy overlay for vehicular and pedestrian traffic

- Moisture-tolerant, two-part epoxy system
- 100%-solids and solvent-free
- Fast-curing with early film strength
- Nonflammable
- Provides attractive waterproof and skid-resistant surface
- Stops chloride ion penetration into concrete
- Superior compatibility with thermal movement in concrete
- Ideal for bridges, elevated slabs, parking garages and balconies
- LEED-compliant

