A blurred high-speed train, primarily red and white, is crossing a cable-stayed bridge. The bridge's concrete structure and steel cables are visible against a clear blue sky. The train is in motion, creating a sense of speed. A blue rectangular box is overlaid on the right side of the image, containing the title text. A green horizontal bar is positioned below the blue box.

# Bridge and Highway Solutions



## BRIDGE AND HIGHWAY SOLUTIONS

Modern bridge infrastructure comprises primarily reinforced or pre-stressed concrete and steel structures. Over the service life of a bridge, these constituent materials are continually subjected to fatigue along with wear and tear due to dynamic vehicular loads. In addition, overloading due to increase in wheel loads has combined with regular exposure to aggressive external elements – like de-icing salts, oil and gas spills, carbon dioxide, and freeze/thaw cycles – to aggravate the situation further. Poor quality of construction and lack of regular maintenance also have contributed to accelerated deterioration of bridge structures. All of these factors have compromised the structural integrity and long-term durability of our nation's bridges, leading to safety and liability issues as well as a serious economic impact.

The rehabilitation of bridges involves addressing a myriad of complex problems, and no single technique or retrofit method offers a complete solution. Therefore, the answer lies in being able to address each individual problem with an appropriate solution to result in a durable structure. The Concrete Restoration Systems (CRS) division of MAPEI North America takes a comprehensive approach to outlining the principle causes of bridge problems and providing a variety of structural retrofit techniques for bridge rehabilitation. MAPEI's CRS specialists and engineers will perform a preliminary analysis and work with the Engineer of Record to establish existing conditions while determining rehabilitation and structural strengthening requirements.

From repair and maintenance to protection to preservation, MAPEI provides owners, designers and contractors with effective solutions to the challenges of bridge repair and a single-source package that you would expect from a world leader in concrete repair. Backed by our field CRS specialists and in-house engineering and technical support, MAPEI brings more than 85 years of experience to the construction industry.

### A. Preservation, Curing and Coatings

1. **Planiseal® Traffic Coat** 100%-solids, epoxy overlay system provides waterproofing (and skid resistance with the addition of aggregate) on bridge decks and suspended slabs. It prevents the penetration of chloride ions into concrete, thus giving high durability and extended service life for concrete decks. The fast-setting version of this product is **Planiseal Traffic Coat FS**.
2. **Planiseal® LVB** low-viscosity epoxy sealer penetrates both new and worn sound concrete decks, healing microcracks and forming a subsurface barrier of protection from carbonation and chloride ion attack as well as extending service life on bridge decks.



*Planiseal Traffic Coat*



*Planiseal LVB*



*Planiseal WR*

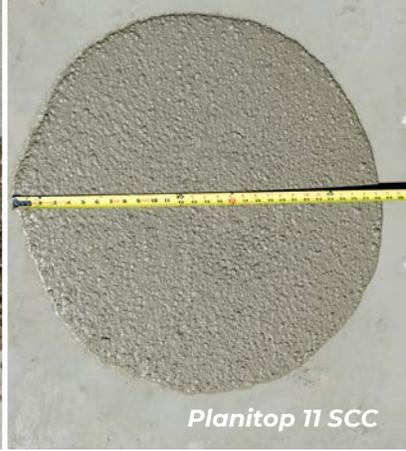


*Elastocolor Coat DOT-MOT*

3. **Planiseal® WR** penetrating, water-based silane/siloxane water repellent helps to protect horizontal and vertical concrete surfaces from moisture-related staining and dirt buildup. **Planiseal WR 40** clear, water-based, 40%-silane penetrating water repellent and sealer is designed to protect concrete and masonry against moisture/chloride intrusion. **Planiseal WR 100** is a clear, high-performance, 100%-silane penetrating water repellent and sealer designed to provide outstanding water repellence on concrete and masonry.
4. **Planiseal® SLV Hi-Mod** is a solvent-free, two-component, 100%-solids, super low-viscosity, epoxy healer/sealer designed to penetrate into new or worn cracked concrete surfaces. *Planiseal SLV Hi-Mod* seals hairline cracks against further moisture penetration and chloride intrusion.
5. **Mapelastic®** flexible cementitious membrane protects concrete pillars, concrete joists and road viaducts from the chemical attack of sulphates, chlorides, carbon dioxide and de-icing salts that can lead to costly repairs. Because of its crack-bridging capacity, it is ideal for concrete surfaces subject to vibration and subsequent cracking. A 5/64" (2-mm) layer of *Mapelastic* is the equivalent of 1" (2.5 cm) of concrete cover.
6. **Mapeshield™ CI 110** is a surface-applied corrosion inhibitor, with an integrated moisture repellent, designed to penetrate concrete and protect embedded steel reinforcement. *Mapeshield CI 110* delays the corrosion process, reduces overall corrosion activity and creates a water-repelling barrier on the surface of the concrete.
7. **Elastocolor® Coat** and **Elastocolor Coat DOT-MOT** are specially formulated to meet the surface coating needs of the bridge and highway construction market, for coating new and previously painted concrete structures. They exhibit superior application qualities and long-term performance on exposure to the environment.
8. **Mapecure™ DR** and **Mapecure DR 1D** are water-based, liquid, membrane-forming curing compounds for freshly placed concrete. Formulated from specially selected dissipating hydrocarbon resins, they are designed to retain water in the concrete for proper hydration, and then to begin breaking down and deteriorating when exposed to traffic, sunlight and weathering. *Mapecure DR 1D* includes an already added fugitive dye, with the same performance that *Mapecure DR* offers.
9. **Mapecure™ AP** is a general-purpose, solvent-borne, styrenated acrylic polymer curing and sealing compound, designed for curing new concrete and sealing new and hardened concrete. *Mapecure AP* produces a medium-gloss, clear film to protect concrete surfaces from water intrusion, dirt and abrasion.
10. **Mapecrete™ Film** evaporation retardant and finishing aid is designed to retard moisture evaporation on freshly placed concrete surfaces, helping to prevent "plastic shrinkage" and cracking.



*Planitop 11*



*Planitop 11 SCC*



*Planitop 18*



*Mapecrete Film*

## B. Concrete Repair and Restoration

### 1. Horizontal Repairs

- a. **Planitop® 11** one-component, pumpable and pourable concrete mix is ideal for partial and full-depth repairs on horizontal, vertical and overhead bridge elements from 1" to 8" (2.5 to 20 cm).
- b. **Planitop® 11 SCC** one-component, cementitious, self-consolidating, polymer-modified concrete mix is designed for form-and-pour and form-and-pump applications on horizontal, vertical and overhead bridge structures. Containing silica fume and a corrosion inhibitor, it can be placed from 1" to 8" (2.5 to 20 cm).
- c. **Planitop® 18** and **Planitop 18 TG** are fast-setting, one-component repair mortars with a corrosion inhibitor that are well suited for bridge-deck overlays and various horizontal Department of Transportation concrete repairs. They can be open to vehicular traffic in as little as one hour, with good resistance to freeze/thaw conditions and de-icing salts.
- d. **Planitop® 18 ES** one-component, rapid-hardening repair mortar with extended working time can be opened to vehicular traffic in as little as six hours and meets the requirements for an ASTM C928 R3 repair mortar.
- e. **Planitop® FD** full-depth repair mortar is for form-and-pour and form-and-pump applications. It is used for the deep-fill renovation of horizontal surfaces on bridges and retaining walls, as well as flatwork repairs.
- f. **Mapecure™ SRA** is a ready-to-use, liquid admixture that aids in reducing drying shrinkage, resulting in a reduction in the formation of microcracks.



*Planitop 18 ES*



*Planitop FD*



Planitop X



Planitop XS



Planitop 23

## 2. Vertical and Overhead Repairs

- a. **Planitop® X** is a very rapid-hardening, fiber-reinforced, vertical and overhead repair mortar, with a corrosion inhibitor, for renovating cast-in-place, pre-cast and post-tensioned concrete structures such as bridges, overpasses, tunnels and retaining walls. It achieves 3,800 psi (26.2 MPa) compressive strength in 3 hours at 73°F (23°C).
- b. **Planitop® XS** is a rapid-hardening, fiber-reinforced, polymer-modified repair mortar containing a corrosion inhibitor. *Planitop XS* provides outstanding workability from featheredge to 4" (10 cm) applications on vertical and overhead surfaces.
- c. **Planitop® 12 SR** fiber-reinforced spray or troweled-applied mortar, with a corrosion inhibitor and silica fume, is for vertical and overhead repairs up to 2" (5 cm). It is sulphate-resistant for a more durable product in adverse environments.
- d. **Planitop® 15** fiber-reinforced fluid mortar, containing silica fume, is for form-and-pour and form-and-pump applications from 3/8" to 4" (10 mm to 10 cm). It is designed for larger repairs of bridge pile caps and bent caps.
- e. **Planitop® 23** two-component, fast-setting, fiber-reinforced repair mortar has a built-in corrosion inhibitor and contains silica fume. It can be trowel-applied or sprayed in vertical and overhead applications up to 4" (10 cm) in two lifts. It is used on bridges, overpasses, retaining walls, tunnels and more.
- f. **Planitop® Shotcrete** is a silica-fume-enhanced, cementitious mortar designed to be machine-applied on horizontal, vertical and overhead concrete surfaces, using the dry- or wet-mix spray process. *Planitop Shotcrete* is a special blend of hydraulic binders, silica fume and well-graded aggregates.





### 3. Corrosion Reduction

- a. **Planibond® 3C** epoxy-modified corrosion inhibitor protects embedded steel reinforcement.
- b. **Mapefer™ 1K** unique polymer, cementitious anticorrosion coating inhibits oxidation and rust formation on steel reinforcement.
- c. **Mapeshield™ I** pure zinc galvanic anode is formulated to stop and prevent corrosion of reinforcing steel. It is available in two different lengths and with 10- and 20-year duration capabilities.
- d. **Mapeshield™ CI 100** and **Mapeshield CI 110** surface-applied corrosion inhibitors are designed to penetrate concrete structures and protect embedded steel reinforcement.





#### 4. Bridge Grouting

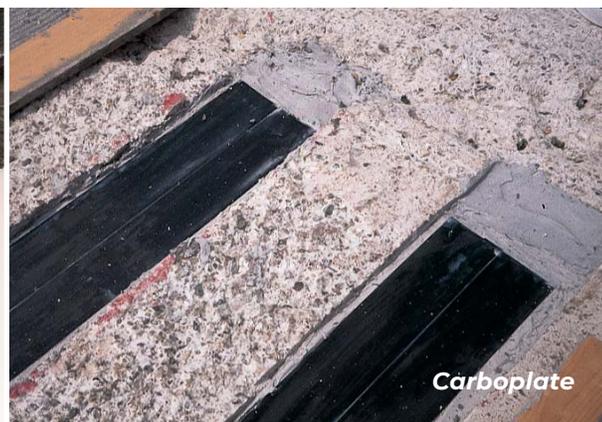
- a. **Planigrout® 755** general-purpose, nonshrinking, cementitious construction grout provides full load-bearing support and uniform load transfer for bridge-bearing pads/seats. It can be extended 30% by weight and placed from dry-pack to flowable consistencies.
- b. **Planigrout® 712** high-performance, nonshrinking cement grout, free of aluminum powder and metallic aggregates, is used for precision grouting of columns, bridge pads and anchor bolts. It offers superior resistance to freeze/thaw conditions and de-icing salts.
- c. **Planigrout® PT** is a non-shrinking, fluid, cement-based grout used to fill the annular space around post-tensioned strands in PT ducts.
- d. **Planigrout® 740** is a high-strength, nonshrink, cementitious tremie grout composed of select fine aggregates, special additives and silica fume for use in off-shore grouting and repair.
- e. **Planigrout® 728** is a one-component, nonshrink, nonmetallic, nonstaining, cement-based precision grout that provides high performance.
- f. **Planigrout® 350** is a high-performance epoxy grout that can be placed in deep-pour applications and where high compressive and dynamic strengths are required.





## 5. Epoxy Injection and Bonding

- a. **Epojet™ LV** two-component, 100%-solids, ultra low-viscosity epoxy resin is used to penetrate hairline cracks by both injection and gravity feed to restore structural integrity to cracked concrete.
- b. **Epojet™** high-modulus, low-viscosity, 100%-solids epoxy resin is designed for pressure injection and sealing of cracks in structural concrete elements.
- c. **Planibond® AE** is a high-strength, moisture-tolerant, zero-VOC, two-part, nonsag, epoxy anchoring gel. And **Planibond AE Fast** rapid-setting, high-strength, moisture-tolerant, two-component, 100%-solids, epoxy anchoring gel is designed for a wide variety of vertical/horizontal bonding and repair applications. Both products are used as a cap seal for pressure-injection epoxy grouting, to seal cracks and to set anchor bolts.
- d. **Planibond® SBA** and **Planibond SBA SlowSet** epoxy bonding adhesives are two-component, 100%-solids and moisture-insensitive. Each *Planibond SBA* adhesive acts as a lubricant and sealer for match-cast precast segments used in span by span and cantilevered erection of segmented precast elements.
- e. **Epojet™ SLV [NA]** is a moisture-tolerant, two-component, 100%-solids, super low-viscosity, epoxy injection resin that penetrates deeply and seals dry and damp hairline, non-dynamic cracks. Its extremely low viscosity creates excellent penetration into fine cracks, provides high bond strength and prolongs life of cracked concrete.
- f. **Planibond® Hi-Mod Gel** is a high-modulus, high-strength, moisture-tolerant, zero-VOC, two-part, nonsag, structural epoxy adhesive designed for a wide variety of bonding and repair applications.





**MapeWrap Primer 1**



**MapeWrap 11**



**MapeWrap 12**

## 6. Structural Strengthening

- a. **MapeWrap**® fiber-reinforced polymer (FRP) structural strengthening systems are for structural repair and reinforcement of structural elements. They consist of flexible carbon and fiberglass fabrics with uni-directional, bi-directional and quadri-directional fibers that are applied with dedicated epoxy resins and topcoats. *MapeWrap* systems are used primarily for the repair and maintenance of deteriorated concrete elements (columns, piers and beams), to improve seismic performance, to upgrade load-bearing capacity and to rectify original design flaws.
- b. **Carboplate**® and **Maperod**® pre-impregnated carbon fiber plates and rods in epoxy resins are used for repair and upgrade of beams and slabs for flexural strengthening, for the reinforcement of structures subject to vibration, and for anti-seismic strengthening.
- c. **MapeWrap**® **Primer 1** is a two-component epoxy primer for smoothing and leveling other *MapeWrap* products for FRP wrap, plate and rod installations. It is designed to work with the impregnating resins **MapeWrap 21**, **MapeWrap 31** and **MapeWrap 31 Slow-Set**, as well as the epoxy putties **MapeWrap 11** and **MapeWrap 12**. The low- and medium-viscosity impregnating resins are for the “dry” and “wet” layup wrap systems, and the thixotropic epoxy putties are for the smoothing of concrete surfaces and for the adhesion of plates and rods.
- d. **MapeWrap**® **C Fiocco** high-strength cord, made from uni-directional carbon fiber threads, is designed to be impregnated with *MapeWrap 21* to provide structural and functional restoration of concrete and masonry elements. *MapeWrap C Fiocco* is particularly suited for restoration of historic structures, including vaulted ceilings and masonry walls.





# Global Leader in Building and Infrastructure Solutions



Epoxy joint sealants and deck overlays/adhesives



Concrete restoration systems



FRP strengthening systems



Underground tunneling products



Products for sports flooring



Concrete admixtures and additives



Waterproofing systems



Deck and floor-covering installation systems



Self-leveling concrete flooring and overlays



Concrete finish coatings

For more information on the complete line of MAPEI products, visit our Website at [www.mapei.com](http://www.mapei.com).

***Elastocolor* =  
High hiding power and superior  
coverage with less effort**



***Elastocolor*<sup>®</sup>**  
**Protective and decorative acrylic coatings**

Severe weather events, changing climate patterns and the natural course of aging take a severe toll on our infrastructure. Our investment in buildings, bridges and highways must be protected against the damaging forces of nature. These structures need long-term protection from the best-performing coatings on the market today, and MAPEI's *Elastocolor* protective and decorative coatings are the right ones for the job.

- High-build coatings for exceptional coverage and hiding in fewer applications
- Designed for maximum durability on exposure and exceptional dirt release, which reduces the need for maintenance
- Advanced color options that are specially formulated with high-performance pigments to ensure optimum UV resistance and color retention
- Unmatched flexibility and crack bridging to accommodate movement in the structure and maintain continuous weatherproof protection





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