



Pile Restoration Timber/Concrete Pile Repair

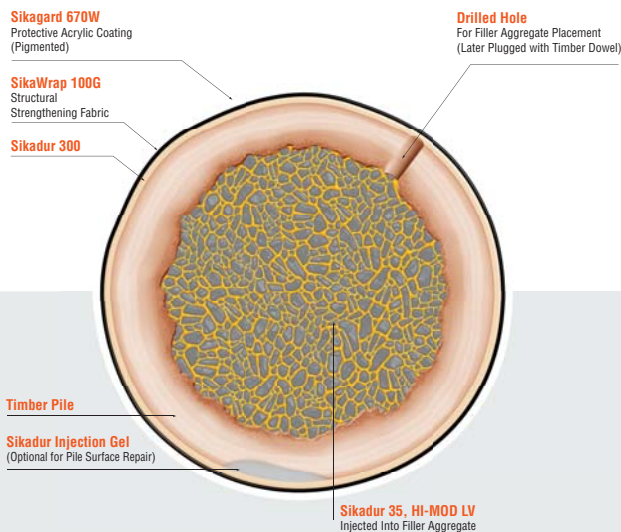
Timber Piles

Methods / Products that Comprise Sika Pile Restoration Systems

Scenario 1 Dry (Over Land)

Symptoms – Decayed Core, Fungal Attack (Outer Layer Intact)

Preparation of Timber Substrate Base Material – Drill holes (3" diam.) through outer layer to penetrate damaged core. Mechanical removal of loose core material by way of vacuuming, flushing, sawing or other approved means. Allow sound timber to drain and dry. Treat core with anti-fungal solution and/or rods (e.g. Borate). Depending on size of cavities and voids in core, place appropriate sized aggregate as filler material. Plug holes with treated timber dowels. Mechanical removal of all surface contamination such as grease, oil, tar, etc. by way of sand blasting, hydro-blasting, wire brushing or other approved means until a clean sound substrate is achieved.



REPAIR PRODUCTS

Sikadur 35, Hi-Mod LV – Injectable, high modulus, low viscosity, epoxy resin to fill finer cracks.

Sikadur Injection Gel (optional)– Injectable, high modulus, epoxy resin paste to seal and repair surface, mount injection ports, pump or tool into larger cavities and voids.

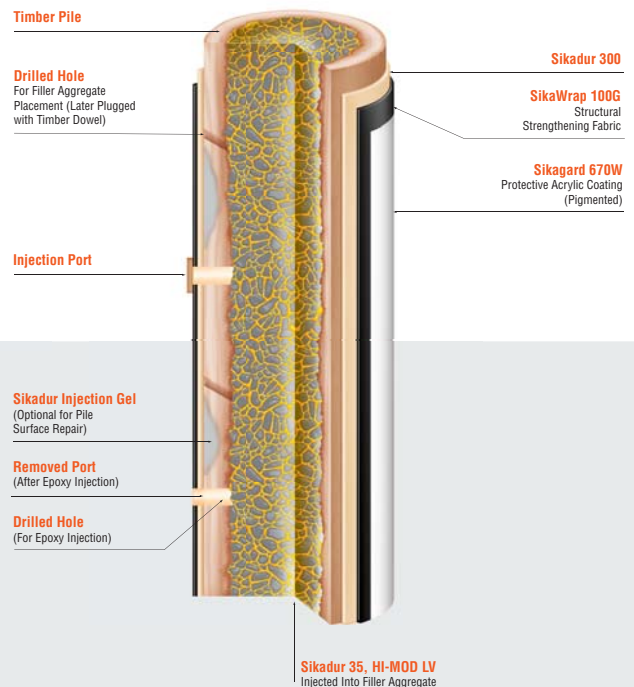
Sikadur 300 – High modulus, high strength, impregnating epoxy resin for wet lay-up fiberglass wrap application.

SikaWrap 100G – Heavy duty, fiberglass wrap fabric for structural strengthening. [Other fiberglass and carbon fiber fabric options to choose from depending on performance requirements.]

Sikagard 670W – Acrylic, UV resistant protective anti-carbonation coating for repaired pile exterior.

Advantages

- ▲ Restore structural integrity of severely decayed timber piles.
- ▲ Epoxy injected into aggregate-filled core develops high compressive strengths to bear loads.
- ▲ Compressive strengths effectively increased by 85% after transverse fiberglass reinforcement applied to provide material confinement.
- ▲ Average compressive strengths of repaired piles exceed published values of common wood species typically used for timber piles.



Scenario 1

DRY (OVER LAND)

Timber Piles

Scenario 2 Wet (Submerged Marine Environment)

Symptoms – Marine Borer Infestation, Rot Decay in Tidal Zones, “Hour-Glass” Deterioration

Preparation of Timber Substrate Base Material – Mechanical removal of loose material and all surface contamination such as grease, oil, tar, marine organisms, etc. by way of hydro-blasting, sawing, wire brushing and other approved means until a clean, sound timber substrate is achieved.

REPAIR PRODUCTS

Fiberglass Reinforced Plastic (FRP) Pile Repair Sleeves – One-piece sleeve used to contain pumped epoxy mortar around damaged timber pile. Easy to install, typical tongue and groove repair sleeves help divers quickly assemble around pile prior to grouting.

Sikadur 35, Hi-Mod LV LPL – Mix with specified aggregate to make a high modulus, high strength, low viscosity epoxy mortar with extended pot life for effective pumping to repair location. [Contact Sika Technical Service Department for more information: 1-800-933-SIKA]

Sikadur Pump-Aid (optional) – Additive to aid equipment's ability to pump when job site conditions prevent proper conditioning (65° – 75°F) of Sikadur 35, Hi-Mod LV LPL before mixing epoxy mortar. [Contact Sika for Technical Data Sheet.]

Sikadur AnchorFix-3/Sikadur AnchorFix-4 (optional) – Fast setting / regular setting versions of Sikadur Injection Gel packaged in convenient, easy to dispense, cartridges. Three cartridge sizes to choose from (8.5, 22 and 55 fl. oz.). Adhesive components mix when dispensed through static mixing nozzles.

Sika CarboDur Rods (optional) – Supplement pile repair with increased flexural strength (as much as 50 to 100%) by encapsulating carbon fiber reinforcing rods within the epoxy mortar or embedding into the timber pile. Available in 1/4" and 3/8" diameters and custom lengths.

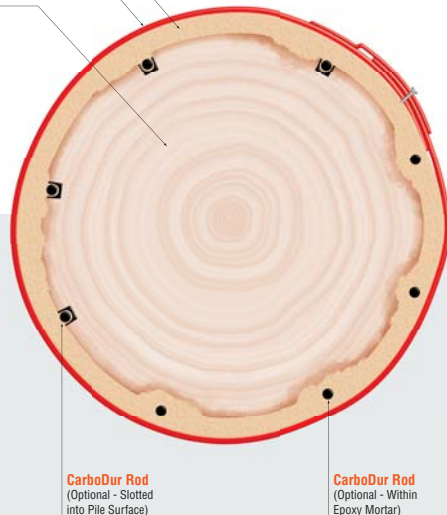
Advantages

- ▲ Provides a hard shell barrier protecting wood against intrusion of marine organisms.
- ▲ Provides a nearly no-maintenance method to prevent future deterioration.
- ▲ Significant cost savings in lieu of conventional timber replacement.
- ▲ Lightweight, space and labor saving option to concrete repair methods.
- ▲ Typical 9,000 psi compressive strength of Sikadur 35, Hi-Mod LV LPL epoxy mortar.
- ▲ Use of optional Sika CarboDur rods effectively increases typical flexural strength of repair by 53%.

Sikadur 35, Hi-Mod LV LPL
Epoxy Mortar

FRP Pile Repair Sleeve

Timber Pile



Decayed Timber Pile



Repaired Pile with Epoxy Mortar

Timber Pile

Adjustable Stand-off
To Provide Annulus

Sika CarboDur Rod
(Optional - within
Epoxy Mortar)

Injection Port

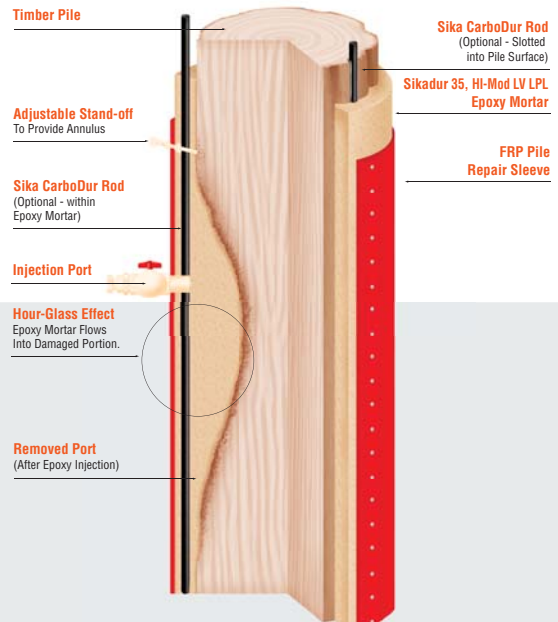
Hour-Glass Effect
Epoxy Mortar Flows
Into Damaged Portion.

Removed Port
(After Epoxy Injection)

Sika CarboDur Rod
(Optional - Slotted
into Pile Surface)

Sikadur 35, Hi-Mod LV LPL
Epoxy Mortar

FRP Pile
Repair Sleeve



Scenario 2

WET (SUBMERGED MARINE ENVIRONMENT)

Concrete Piles

Methods / Products that Comprise Sika Pile Restoration Systems



Scenario 3 Wet (Marine Environment)

Symptoms – Spalling, Corrosion of Reinforcement

Preparation of Concrete Substrate Base Material – Mechanical removal of loose material and all surface contamination such as laitance, grease, oil, tar, etc. by way of shot blasting, scarifying, sand blasting, hydro-blasting, grinding, wire brushing or other approved means until a clean, sound concrete substrate is achieved.

REPAIR PRODUCTS

Fiberglass Reinforced Plastic (FRP) Pile Repair Sleeves – One-piece sleeve used to contain pumped or poured epoxy mortar or cementitious grout around damaged concrete pile. Easy to install, typical tongue and groove repair sleeves assemble quickly around pile prior to grouting.

Sika MonoTop 611 – High, early strength, single component, polymer-modified, silica fume enhanced cementitious mortar for effective pumping to repair location.

Sikament 100 SC – For underwater placement, anti-washout admixture for Sika MonoTop 611 to produce grout that is fluid and highly resistant to dilution and segregation. [Contact Sika Technical Service Department for more information: 1-800-933-SIKA]

Sika FerroGard 901 – A liquid concrete admixture formulated to protect embedded reinforcing steel from corrosion and to provide means for extending the service life of concrete structures.

Sika Galvashield Anodes – (optional) Innovative, long-lasting, sacrificial, zinc anodes activated by the surrounding Sika MonoTop 611 cementitious mortar. Quickly and easily fastened to exposed steel reinforcement, used to control ongoing corrosion and prevent the initiation of new corrosion activity.

Sikadur Injection Gel – High modulus, high strength epoxy resin paste used to seal foam gaskets and seams of FRP Pile Repair Sleeves. Also use to seal and repair concrete surfaces, pump or tool into larger cavities and voids.

Advantages

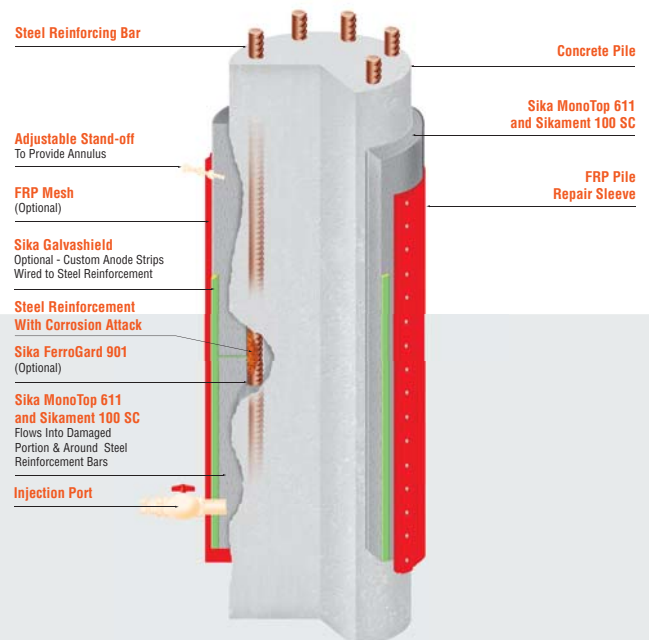
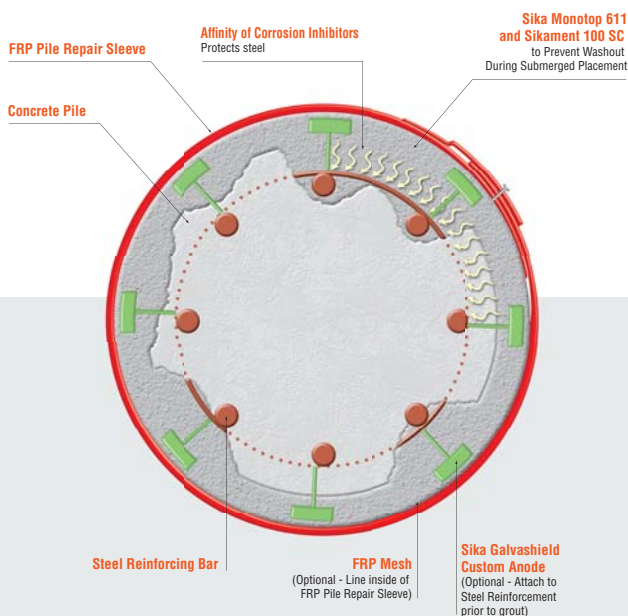
- ▲ Pump Sika MonoTop 611+ Sikament 100 SC through smaller diameter hoses than standard concrete pumping procedures allow. Increases versatility of mortar placement allowing greater access to smaller voids.
- ▲ Sika MonoTop 611+ Sikament 100 SC drives out water and bonds well to prepared concrete substrate.
- ▲ Cost effective alternative to conventional concrete removal and replacement methods.
- ▲ Optional corrosion protection and prevention methods significantly extend expected service life of repair.



Repair Mortar with
Anti-Wash-Out Admixture



Hardened repair material, underwater.
Cross Section of Repaired Pile.
Repair Material Thickness = 1.5" - 2"



Scenario 3

WET (MARINE ENVIRONMENT)

Pile Restoration – Sika Repair Solutions



Pile supported structures are commonplace throughout the world. Whether supported by timber, concrete or steel piles, structures incorporating these methods of elevation and support define thousands of miles of the world's coastlines and are major components of bridges over both land and sea. Structures supported by piles built along waterfronts, providing modes of transportation and trade, play a vital role in the world's economy.

Historically, the lack of monitoring and regular maintenance are the primary reasons for structural piles falling into a state of disrepair. Traditional methods of repair vary for piers where deterioration of aging pile supports has occurred. Complete removal and replacement methods, heavy encapsulation with new concrete and supplementation of existing piles with additional piles typically prove to be a costly repair no matter what the structure type or prevailing environmental conditions may be.

In cases of timber pile applications over land, significant damage due to dry rot, termite infestation and / or fungal decay of the wood are the primary concerns. Wood preservative treatments tend to penetrate into only the outer layer of large timbers. Over time as large timbers dry, the wood tends to shrink. Internal shrinkage causes voids, which provide a pathway for fungi to enter the untreated portion of the timber and cause decay within the core, creating a virtual hollow shell.

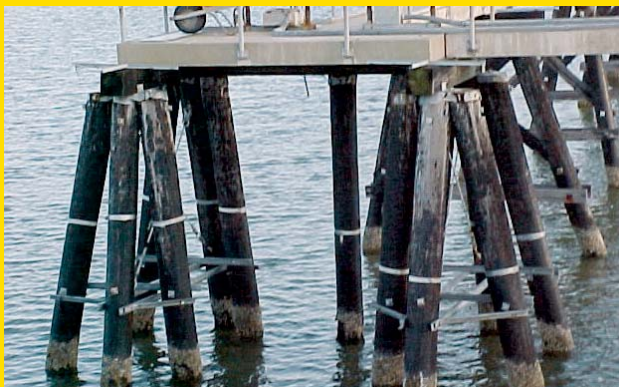
Timber piles that support piers over water suffer damage for different reasons. Floating debris, freeze-thaw cycles, adverse effects of pollution, saltwater, fuels, chemicals and collisions with sea-faring vessels contribute to the need for improvement. Rot decay in tidal zones is common. Environmental efforts to improve the quality of waterways have resulted in a proliferation of living organisms known as marine borers (i.e. limnoria, teredo), which thrive on the wood and have a detrimental effect on the piles' load capacities.

Concrete piles present challenges typical of where Sika's expertise in repair and protection lies. Deterioration due to moisture, chemical and chloride intrusion causing the corrosion of reinforcing steel are documented problems of the industry. Changes in the end use of the supported piers may require the supporting concrete piles to be strengthened.



Sika, in cooperation with other suppliers, now offers systems and solutions for the repair of damaged piles. Fiberglass Reinforced Plastic (FRP) Pile Repair Sleeves wrap around the pile and contain various grouting material options manufactured and supplied by Sika. In situations where corrosion of steel reinforcement in concrete piles needs to be addressed, Sika offers Total Corrosion Management Solutions, including consultation, services, and products.

Extensive testing, field experience and high quality control in the manufacturing of products fully support all components of the Pile Repair concept. Ultimately, the long-term solutions to your Pile Restoration projects are now available through Sika!



1-800-933-SIKA Nationwide
www.sikaconstruction.com



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One Source.
Worldwide.

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