

CONCRETE ENCASEMENT MARINE PILE REPAIRS

Proserve Ltd

Princes Drive
Kenilworth
Warwickshire
CV8 2FD

UK: 01926 512222

Int: +44 1926 512222

office@proserveltd.co.uk

www.proserveltd.co.uk

PILE JACKET





We think concrete function, durability & constructibility

Proserve have over 50 years' experience developing systems for marine construction, we understand the challenges of working with concrete underwater.

A company owned and run by professional engineers; we bring value to our global client base through collaborating with partners to develop construction methods and formwork solutions to enable reliable construction.



Martin Hawkwood
Director & Principal Engineer

OVER 50 YEARS OF PROVEN PERFORMANCE

Fabric formwork technology

Fabric formwork is an accurate and reliable method of placing concrete in the marine environment, pump filled in situ, the concrete sets in the required position, with the fabric shuttering controlling both the placement and avoiding washout.

1966

Revetment Protection
River Arun
UK



1995

Hard Pad Foundations
Confederation Bridge
Canada



2013

Caisson Foundations
MOSE Project
Venice



2017

Pier Foundations
La Reunion



1983

Scour Protection
Port of Belawan
Indonesia



2010

Caisson Seals
Olmsted Dam Project
USA



2016

Scour Protection
Puerto Quetzal
Guatemala



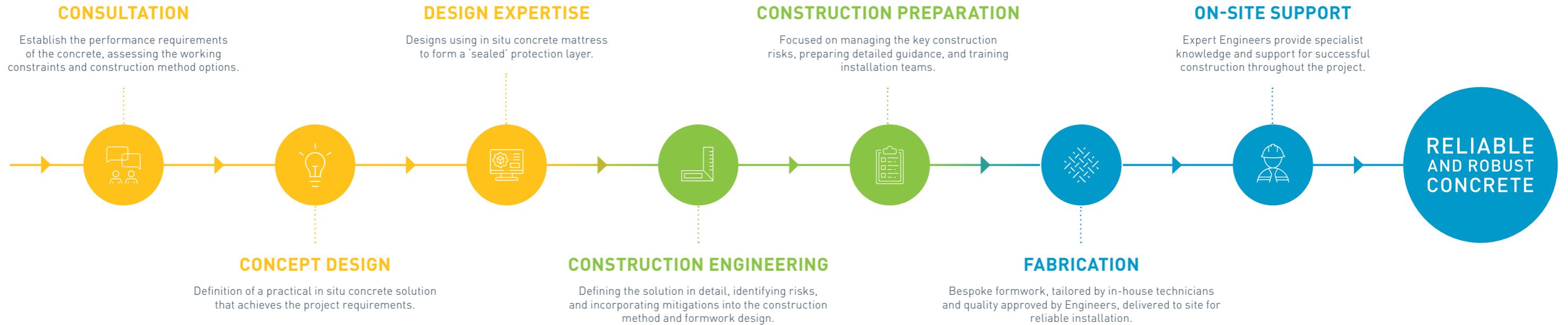
2020

Scour Protection
Cruise Terminal
Port Canaveral, USA



OUR SERVICE

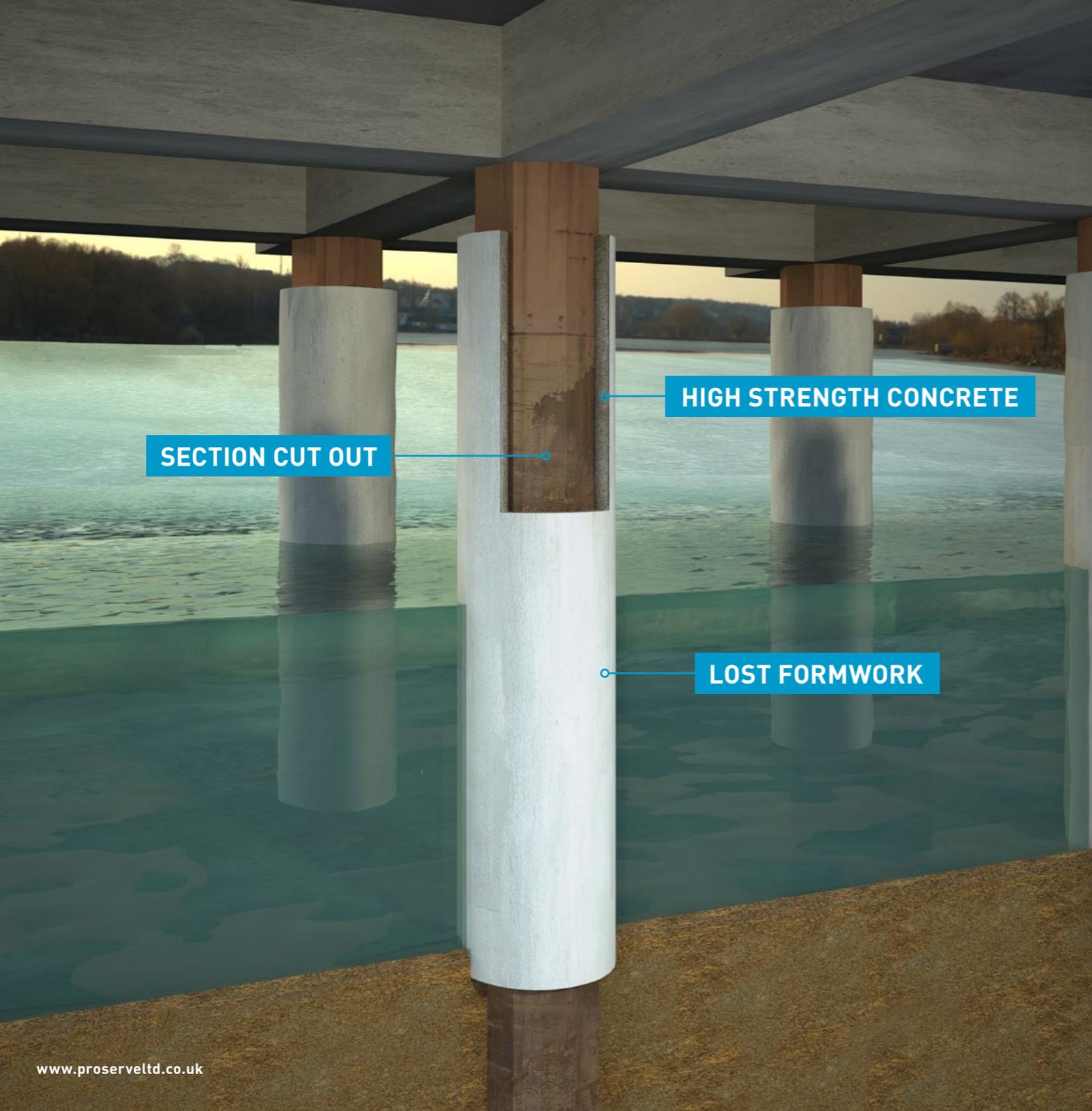
On every project we use our experience and expertise to identify the core project requirements and working constraints. This allows us to create solutions that are practical and improve the constructability of the project.



MARINE PILE REPAIRS

Steel and reinforced concrete marine piles can deteriorate over time due to the corrosive marine environment eroding the structural strength of the piles, severe cases can occur with total loss of structural capacity compromising the life span of the structures they support.



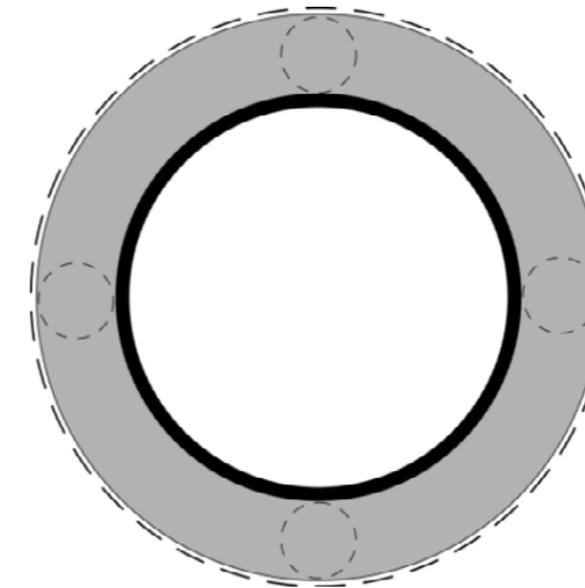


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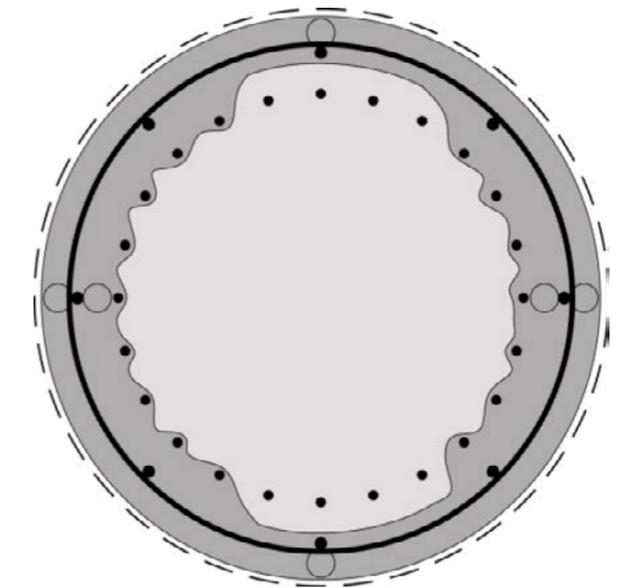
Concrete Encasement

Fabric formed concrete can protect, repair or strengthen piles through encasement in high quality concrete. Especially suited to projects where underwater installation is required, the repairs can be designed for medium to long-term protection prolong the lifespan of jetties and marine structures.

The porous formwork causes the sand & cement micro concrete mix to bleed down to a water:cement ratio approaching 0.4. This gives a significant improvement in durability against carbonation and chloride ion penetration. Steel reinforcement can be included for strengthening where required.



Steel repair section



Concrete repair section

INSTALLATION PROCESS

Each step is taken to ensure a minimum thickness of high quality encasement is achieved.



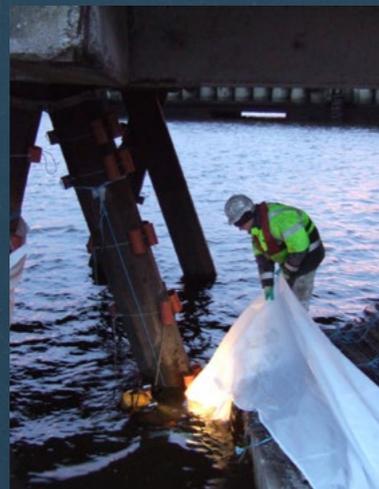
1 CLEANED & REPAIRED

Marine growth and spalled concrete are removed, and the piles cleaned back to bright steel, typically using high pressure water jetting.



2 FIX SPACERS

Any reinforcement is prepared in split-cages for installation in 2 halves, and spacers fixed to control the encasement thickness. Concrete spacers are used for raker piles.



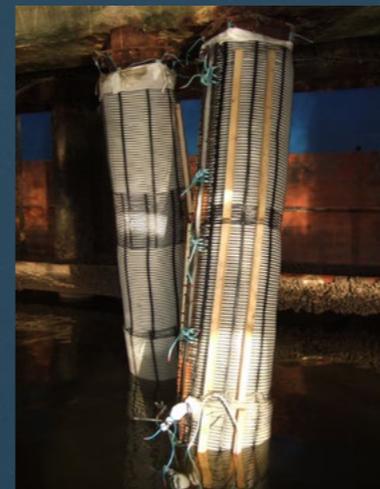
3 PLACE & ZIP FORMWORK

Re-usable top and bottom clamps are fabricated locally by the Contractor and fitted to the pile. The pile jacket is hung from the top clamp, zipped up, and fixed to the bottom clamp.



4 FIX RE-USABLE CORSET

The corset restrains the filling tension of the pile jacket. Corsets are made up by the Contractor in lengths to suit site handling, and socketed together for longer lengths.



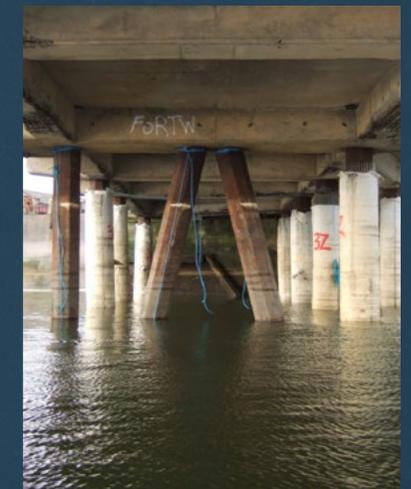
5 PUMP FILL IN TREMIE FASHION

The pile jacket is filled typically at 1 to 2 vertical m/hr by diver, with a worm pump and 50mm diameter rubber hose, via filler sleeves at 2m c/c up the pile.



6 CONCRETE ENCASED PILE

The following day, clamps and corsets are removed for re-use, and filler sleeves may be cut off flush if required.



PILE REPAIR USING CONCRETE ENCASEMENT

Bulk Jetty, Dublin Port

Engineer: Jacobs

Year: 2006

Pile Type: Rendex steel

Project

The Bulk Jetty was built in 1950. The steel piles to the jetty were in such a poor condition with many piles holed through corrosion that the structure was considered for demolition. The pile jacket system enabled strengthening and protection by concrete encasement and allowed the jetties use to continue.

Design

The jetty piles had suffered from Accelerated Low Water Corrosion. Following a steel thickness survey and structural appraisal, the Consultant Engineers selected a 100mm thick concrete encasement with weakened lengths to be reinforced with steel sprit rings.

Mix

A traditional 2: 1 sand: cement micro concrete mix was developed to achieve C35 / 45. strength. Polypropylene fibers were included to aid shrinkage control. A site test was conducted on the strengthening arrange to demonstrate the systems use.

Solution

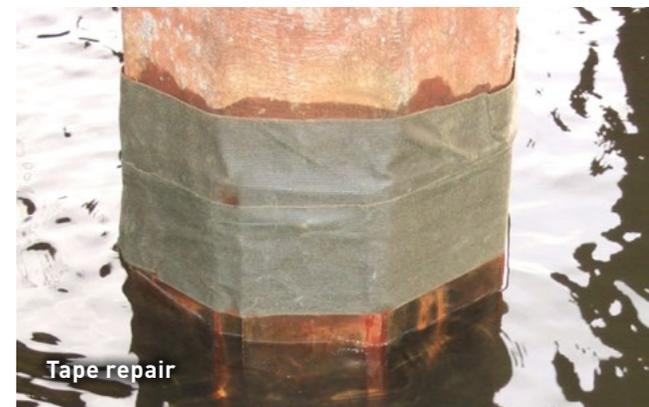
The rendex steel section piles where high-pressure jet cleaned and inspected before the pile jacket system was applied. 138 piles where protected including raker piles. Pile encasement lengths were typically 9-11m long down to bed level. The top 0.3m of the pile was protected by sprayed concrete onto joint continuity mesh reinforcement. The work was completed in some 7 months, generally using 2 dive teams., putting the jetty back into working condition.

PILE REPAIR USING CONCRETE ENCASEMENT

Bulk Jetty, Dublin Port



Corroded piles



Tape repair



Concrete encasement

PILE REPAIR USING CONCRETE ENCASEMENT

Vâlcea, Romania

Engineer: Jacobs

Year: 2006

Pile Type: Rendex steel

Project

Proserve's pile jacket system was used to provide 100mm thick insitu concrete encasement to 29 No 2m diameter reinforced concrete bridge piers, filling cracks which had developed over the lifetime of the structure, and protecting against further damage to the piers from cracking and corrosion of the existing reinforcement.

Construction

The pile repairs were undertaken by contractor Domarcons as part of wider refurbishment works on the European Route E81 at Călimănești, Vâlcea. A 6 m encasement length was undertaken on all piles. The piles were accessed on pontoon working platforms via a truck mounted underbridge inspection unit, for mobile working under the bridge with live traffic overhead. The system was installed by divers, assisted by operatives on the working platforms. A temporary steel frame was used for additional support of the reusable mesh corset to provide improved vertical filling and cover control for the large 2.2 m diameter pile encasement.

Concrete Mix & Filling

Pile jackets were filled with a highly fluid sand:cement micro concrete via filler sleeves at 2m centres vertically up the piles. Filling was undertaken in tremie fashion to avoid washout. Upon reaching the top of the protection length, the mix was allowed to set and the temporary box sections, mesh corset and top and bottom friction clamps, were removed the following day. The lightweight pile jacket system enabled concrete encasement of the large diameter piles beneath the live carriageway without the need for heavy lifting or floating plant.





Before Encasement



Jacket Restrained



Encasement Completed



PILE REPAIR USING CONCRETE ENCASEMENT

Vâlcea, Romania

proserve

MARINE CONSTRUCTION ENGINEERS

CONTACT

Get in touch for any technical or project assistance.



Matt King
Senior Engineer

Matt.king@proserveltd.co.uk

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