proserve
MARINE CONSTRUCTION ENGINEERS

CONCRETE MATTRESS SCOUR PROTECTION

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INLAND BRIDGES

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 Hawkswood
Director & Principal Engineer

OVER 50 YEARS OF PROVEN PERFORMANCE

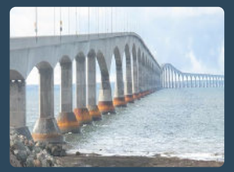
Fabric formwork technology

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

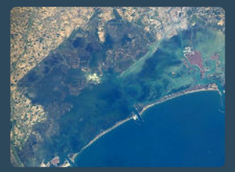
1983
Scour Protection
Port of Belawan
Indonesia

1995
Hard Pad Foundations
Confederation Bridge
Canada



2010
Caisson Seals
Olmsted Dam Project
USA

2013
Caisson Foundations
MOSE Project
Venice



2016
Scour Protection
Puerto Quetzal
Guatemala

2017
Pier Foundations
La Reunion

2020
Scour Protection
Cruise Terminal
Port Canaveral, USA

OUR PROCESS

Proserve 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.

CONSULTATION

Establish the performance requirements of the concrete, assess the working constraints and construction method appraisal.

CONCEPT DESIGN

A concrete construction solution with a formwork design optimised for the required concrete performance comprehensively value engineered enabling clients to make informed evaluations of their options.

CONSTRUCTION ENGINEERING

Developing and detailing the concept solution, construction process and formwork design to ensure the most reliable and cost-effective method of construction is used.

CONSTRUCTION PREPARATION

Focused on managing the key construction risks, preparing detailed guidance, and training installation teams.

FABRICATION

The fabric formworks are tailored by in-house technicians to the project specifications, delivering the formwork to site ready for installation.

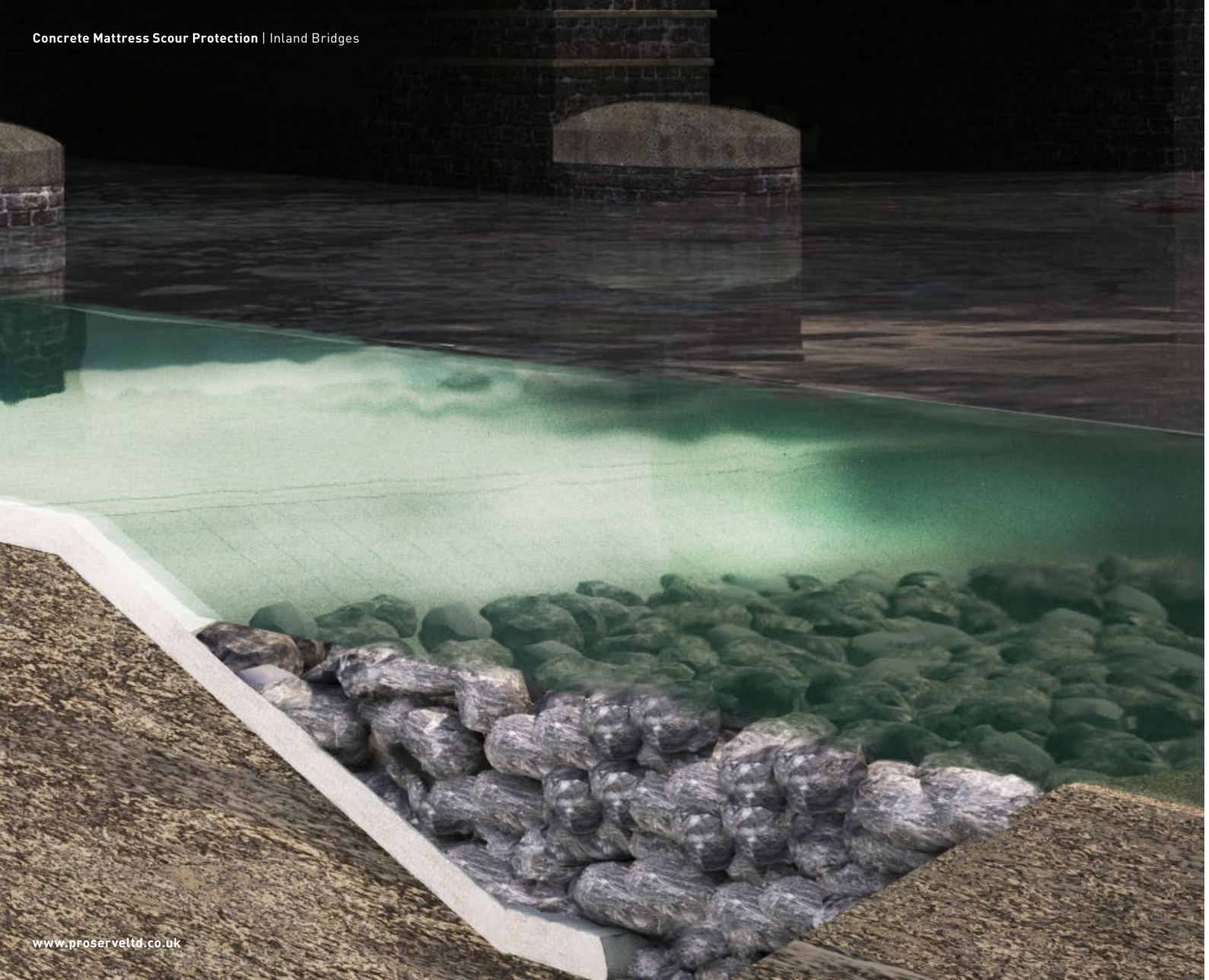
ON-SITE SUPPORT

The required support is provided by expert Engineers for successful construction throughout the project, from global on-site support to continuous office-based assistance, construction partners are supported until the job is done.

Bridge Scour

Bridges can suffer from scour when flow conditions change, or rivers go into flood. This scour can threaten the structural integrity of bridges if allowed to develop, which can lead to settlements and failure.

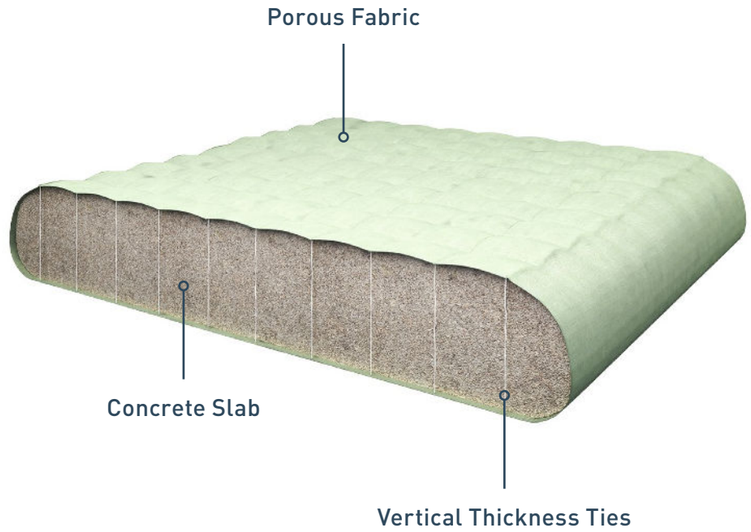
Fabric formed concrete mattress offers reliable and long term protection from scour.



System Explained
Concrete Mattress Solution

Fabric formed concrete mattress seals against the piers and abutments preventing flow from eroding material under the mattress. The slab consists of high-quality plain concrete, able to resist flows of over 12m/s with a design life of 50 years or greater.

The slab extends beyond the structure, outside the influence of both local and contraction scour. The edges are usually protected with riprap to prevent underscour occurring or embedded as appropriate.



Installation

The formwork is tailored to suit all structures, arriving on site ready for installation. The system can be placed in the wet or the dry and is pump filled with micro-concrete. The fabric panels are laid on the bed, zipped together and filled one after another to form the interlocking concrete slab tailored for the shape of the bridge.

STEP 1

Create calm conditions for installation

STEP 2

Preparation of the bed levels & place formwork

STEP 3

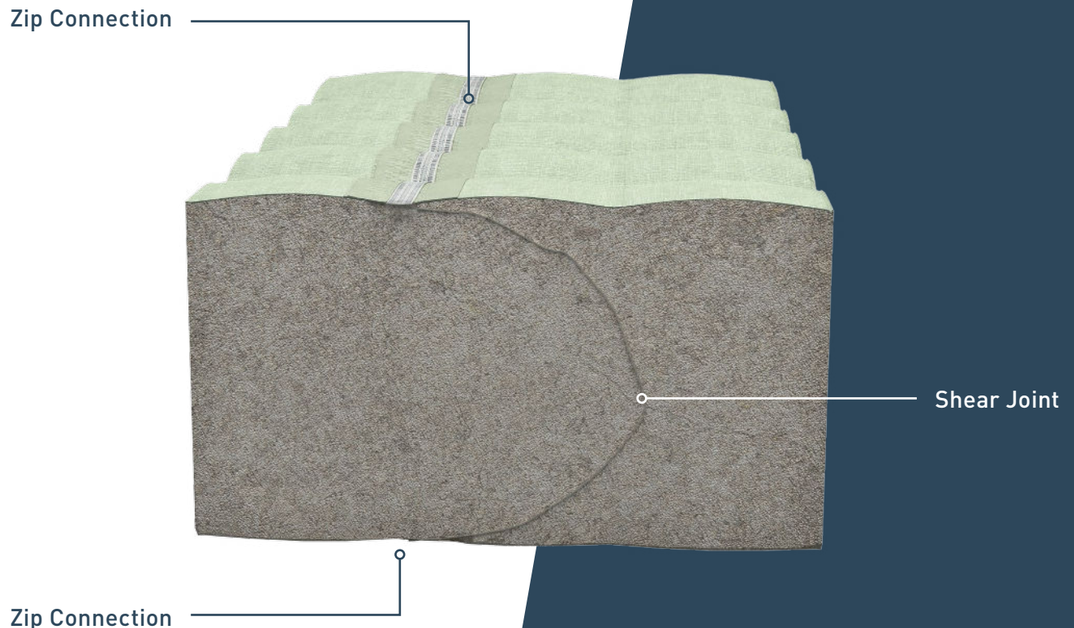
Pump fill formwork

STEP 4

Once filled, place edge protection

Concrete Mattress

A top and bottom zip connection produces a ball and socket shear, creating a continuous concrete slab over large areas. A 220mm thick slab is designed for most bridge scour conditions, slabs of 100mm-600mm can be produced where required.



Advantages

Once installed, the continuous concrete slab can resist high flows with little maintenance, while its low thickness maximises both foundation depth levels and flow area capacity combating flooding.

CASE STUDIES

A selection of bridge scour protection case studies, detailing the various construction methods used.

River Anker

Contractor: Kaymac Marine

2019

Frame dams are often used as an effective method of flow diversion on large span or multi-span bridges to create a dry area for mattress installation one side at a time.

We work with the contractor to define the optimal mattress layout to suit the frame dam sequencing and provide zip flap joints to facilitate creation of a ball and socket joint between each phase of mattress installed.

Once Kaymac had dug the bed to the required levels, they found that the bases of the piers were wider than expected meaning the mattress needed to be adjusted to fit. Kaymac contacted us and we led them through the required adjustments so that the mattress fitted perfectly around the piers.

River Street

Contractor: Scour Protection Ltd

2017

Bunds were used to allow divers to install the mattress in still water, while the river was able to flow through the other bridge span.

Once the mattress was installed in calm conditions, the bunds were moved to the other side and the final mattress installed to complete the scour protection to the bridge.

Zip flap connections were used between the mattresses of Phase 1 and Phase 2 to ensure a ball and socket joint was formed between both phases resulting in a continuous constant thickness of plain concrete.

Slymlake

Contractor: Suttle Projects

2019

Upstream and downstream bunds are commonly used to create a dry area for mattress installation. The river water is either overpumped or diverted into flume pipes and discharged beyond the downstream bund.

Where the overpumping pipes do not need to sit on the bridge invert mattress installation can be quick, a single phase that is often completed in a single day. If the overpumping or flume pipes need to sit on the bridge invert, we split the mattresses down the middle, install on one side before moving the pipes and then installing on the second side.

Slymlake required 2m wide mattress panels to limit the amount of open excavation at one time. This mitigated the risk of the bunds being overtopped in a flash flood event and washing out the foundations.

Shaw Wood Road

Contractor: Kaymac Marine

2017

Large flume pipes were required to create dry conditions for mattress installation. Half of the mattress was installed before the flume pipes were placed on top of the filled mattress and the other side was then dewatered and the mattress installed to complete the bridge scour protection.

Bartley Water

Contractor: Suttle Projects

2018

Once on site to install concrete mattress, the same plant and materials can be used to protect embankments up and down stream. This removes the need for traditional handling of 25kg concrete filled bags, a major win for health and safety and quality of construction.

The Hessian face on the wall is designed to decay and encourage vegetation, while the long lengths and stretcher bond pattern provide a stable interlock which can resist very high river flows in flood.

CONTACT

Get in touch for any technical or project assistance.

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