PROJECT PROFILE

GRACE

Blackpool Sea Defences
Blackpool, UK

Revetment units leading up to Blackpool Tower

The Site
For over 100 years Blackpool's coastal defences have battled tirelessly to protect the UK's most famous holiday resort from the elements. But a major tranformation took place thanks to a £66 million Defra-funded project that has shown the world the way forward in concrete reinforcement technology.

Blackpool's sea defence wall and promenade underwent a complete reconstruction as part of a four-year Central Area Coast Protection Scheme. The project is designed to prevent shoreline erosion and protect more than 1,500 business and residential properties from flooding. It forms a major part of Blackpool Council's ambitious £1 billion regeneration master plan, which stretches from the Sandcastle Waterworld, near Blackpool's south pier, to beyond the north pier.

The Challenge
The project posed a number of challenges; primarily the proximity to the sea presented a corrosion problem with the traditional steel reinforcement option. As well as this, the chosen solution would need to increase the impact and fatigue qualitites of the concrete.

A high level of consistency and a quality finish were also important due to the prestigious location, whilst maintaining construction programme times.

The Solution
Grace were called upon to supply their Strux 90/40 synthetic macro-fibre technology to reinforce much of the concrete that was being installed along the length of Blackpool's promenade. It was the first time that synthetic macro-fibre technology had been employed to reinforce major concrete elements in marine coastal defences. It is extremely tough and durable and, due to its ability to impart high residual strength to concrete, is the first synthetic macro fibre truly capable of replacing its traditional steel counterparts in terms of increasing the impact and fatigue qualities of concrete.

Despite being so small, the fibres provide sufficient strength and crack-control properties to match any steel reinforcement counterpart, thereby providing enormous time and labour cost savings. In terms of marine defences it also stands head and shoulders above the traditional steel reinforcement because it is totally non-corrosive. Using ferrous-based reinforcement in an environment where aggressive chloride ions (i.e. salt), oxygen and water predominate, presents an almost inevitable risk of maintenance problems in the future. Taking away the source of the corrosion problem while still maintaining the performance levels of the concrete was thus the primary aim of the Central Area Coast Protection Scheme.

Strux 90/40 was used in two main areas of the Blackpool project; poured in situ to create a 3.2 km-long toe beam, which will hold 10,000 steel sheet piles firmly in place, and act as a 'stop' to the sea defence steps, or revetment units, which rise from the toe beam to the promenade. It was also used in the revetment units, which were precast off site.

The revetment units sit four or five deep behind the toe beam, acting as both a seating area for holidaymakers and a barrier to the sea — where each step gradually dissipates the force of the incoming waves.
Each 20-tonne unit contains 8m^3 of fibre-reinforced concrete. In total, about 2,900 step units were cast, equating to about 23,000m^3 of concrete.

Apart from the technical and environmental benefits, the use of Strux 90/40 also reduces labour and construction time. Using Strux 90/40 also removes the logistical headache of transporting tonnes of steel mesh on to the construction site and finding somewhere safe to store it. Pouring the concrete into precast moulds off site without the problems connected to the placement of steel cages has also speeded up that side of the operation.

'It was the first time that synthetic macro-fibre technology, like Strux 90/40 had been employed to reinforce major concrete elements in marine coastal defences'

Paving with exposed aggregate finish achieved by VBA Surface Retarder

PRODUCTS USED

Strux® 90/40
ADVA® 410
Pieri® VBA Surface Retarder
Pieri® Decagel
Pieri® Release Agents

CREDITS

Owner: Blackpool Council
Consultant Engineers: Halcrow Group Ltd
Precast Manufacturer: SLP Precast Ltd
General Contractor: Birse Civils Ltd
Readymix Concrete Supplier: Tarmac Central

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