CASE STUDY

Geotextile Tube Application For The Construction of The Longest Sea-Crossing Bridge in Vietnam

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Lach Huyen Bridge Work Platforms

Introduction

More than 27 km of geotextile tubes were installed to reclaim the 4.1 km × 26 m work platforms and to construct the 600,000 m³ dredged sediment containment facility for the construction of Lach Huyen Bridge in Vietnam.

The in-progress 5.44 km (almost 3.5 miles) bridge, which accommodates a four-lane highway, spans across the combined estuary of the Bach Dang and Cam rivers. When completed in 2017, the Lach Huyen Bridge will be the longest sea-crossing bridge in Vietnam, providing a shortened link between Haiphong and the Lach Huyen port that is also currently under construction.

About 23 km (14.3 miles) of geotextile tubes were used for the construction of the reclamation dikes. The tubes were segmentally stacked up to five layers high for the construction of the work platforms. The tubes used for the construction of the reclamation bund comprised of circumferences of 4.6, 6, 7.5, and 9.5 meters, with typical lengths of 50m.

Client :
Ministry of Transport, Vietnam Project Management Unit 2

Contractor :
Sumitomo - Mitsui Construction Co., Ltd.
Truong Son Construction Co., Ltd
Civil Engineering Construction Corporation No. 4

Consultant :
Oriental Consultants Co., Ltd.
Japan Bridge & Structure Institute, Inc.
Nippon Koei Co., Ltd.
In association with TEDI - TIDICC - APECO

Material :
Geotube® Systems

The work platforms, together with the geotextile tubes, will eventually be embedded within a future land reclamation that will enlarge the Dinh Vu Development Area to approximately double its current size. A portion of 1.3 km of the bridge was constructed by the offshore method using work barges.

A 1km-long channel along the alignment of the bridge was dredged to increase water depth sufficiently to allow the work barges to operate without any low tide interruptions. A dredged spoil containment facility was required. Geotextile tubes were also used to construct the perimeter dike of the containment facility. It was constructed using geotextile tubes with a standard length of 15 m and circumference of 9.5 m. The bottom level consists of two units placed side by side and a top unit placed centrally above that.

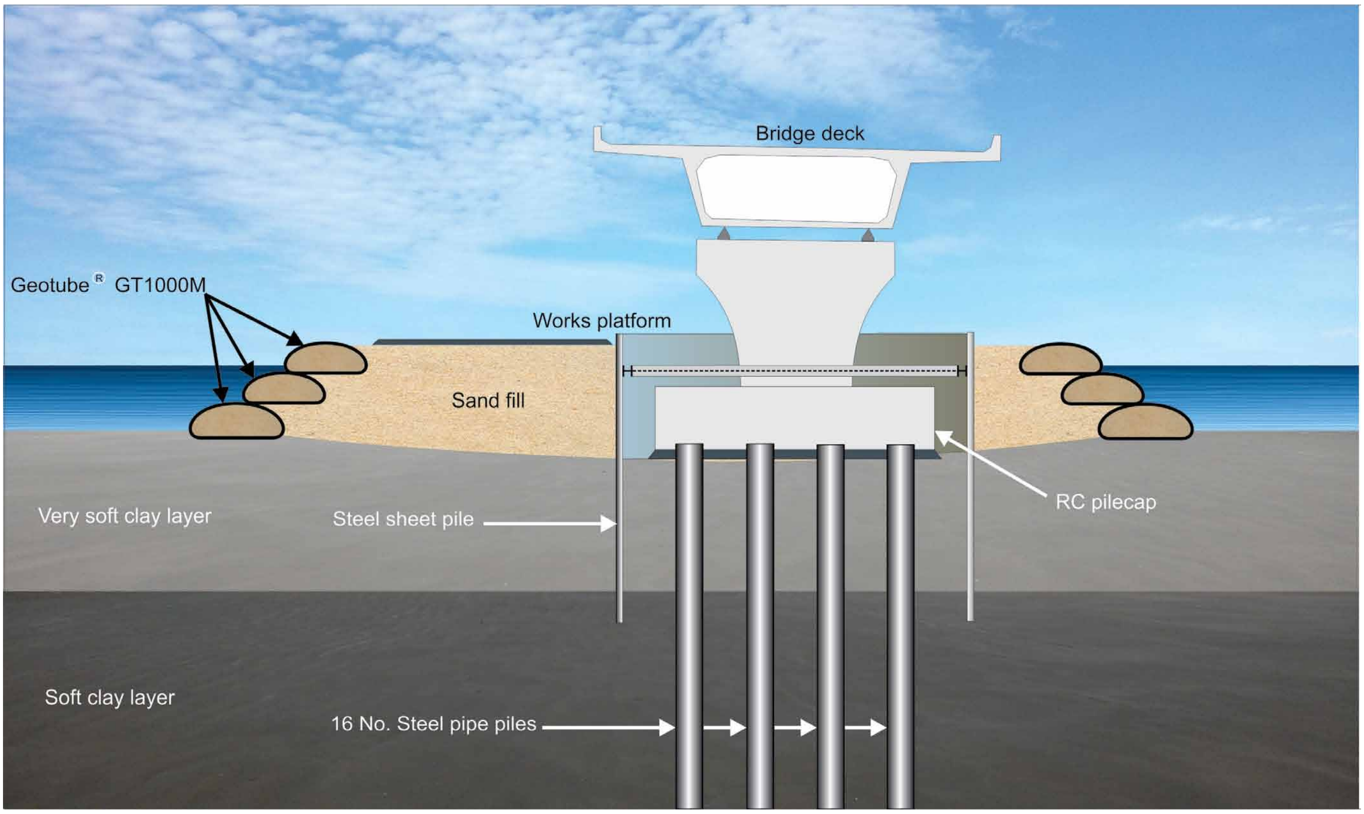
Construction

The construction methodology needed to overcome soft soil conditions, withstand typhoons, and avoid disruptions to construction activities (by the large daily tidal ranges) so that the bridge could be completed within the targeted project duration.

> Bridge construction work required heavy machinery for installation of foundation piles, construction of bridge piers, and launching of bridge sections.

To allow bridge construction activities to be carried out on dry land expediently, two construction work platforms were reclaimed along the alignment of the bridge. The work platforms, with approximate width of 26 m and 4.1 km in total length, were built to reduced level (RL) 2.55 m—above the highest tide levels and out of reach of storm surges and impacting waves.

Rock is commonly used to construct containment dikes for reclamation work but it is difficult to source in this area. Sand is readily available and is dredged from the channels nearby for the reclamation of the work platforms. Dredging is carried out using a suction dredger. The dredged sand is stored in a temporary storage yard for use as reclamation fill to construct the work platforms. Because sand is readily available, the geotextile tube solution became an economical alternative to the rock fill solution.



It was convenient to tap into the hydraulic delivery of the sand for the installation of the geotextile tubes. If the rock fill solution was adopted instead, not only would the rocks have to be purchased at high cost and transported over a long-haul distance, but the placement of the rock fill would have been challenging in the tidal and soft seabed conditions.

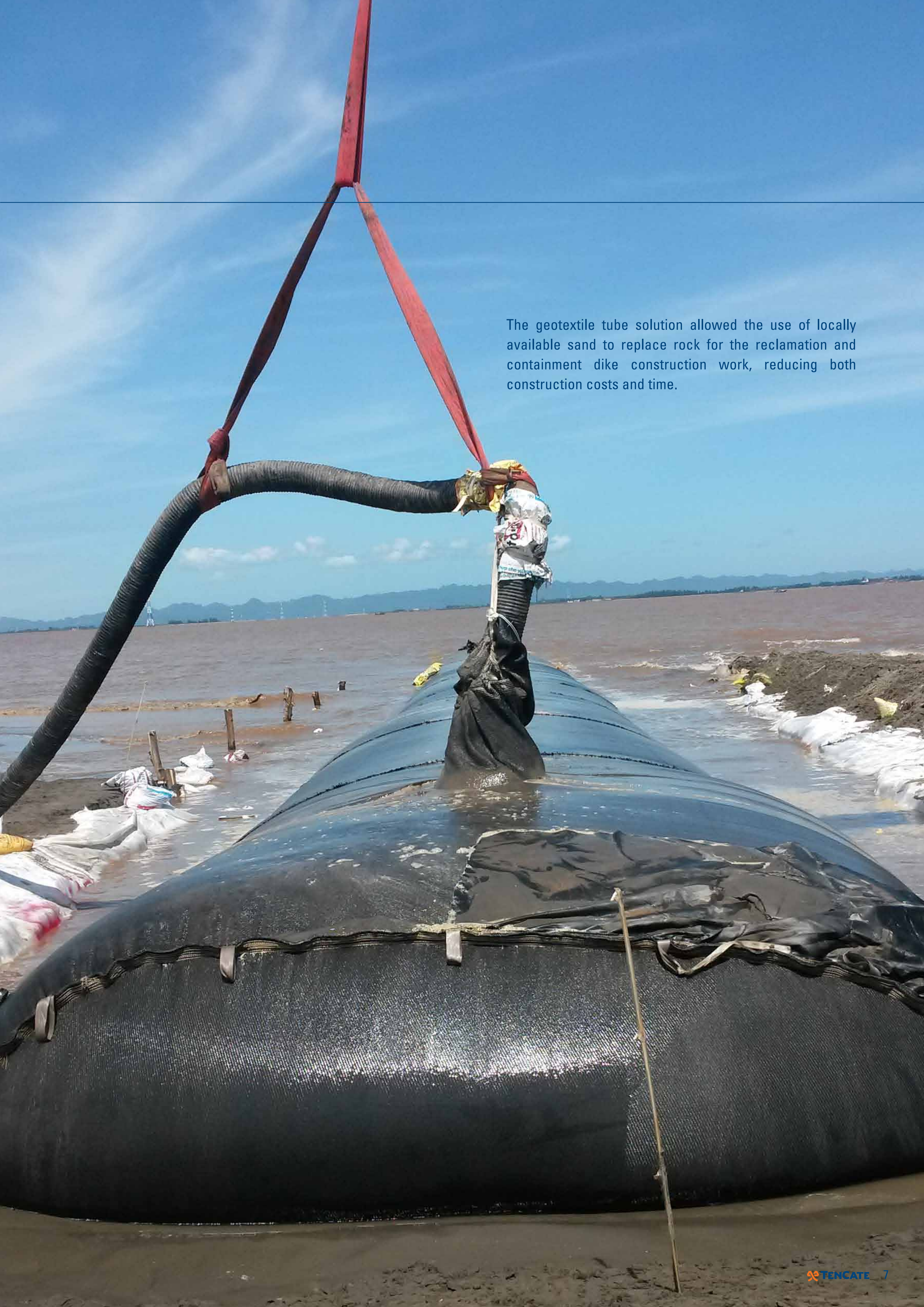
Bridge construction works required heavy machinery for installation of foundation piles, construction of bridge piers, and launching of bridge sections. The two main construction challenges were the soft ground and adverse tidal conditions, which created difficulties for the heavy machinery.

A portion of the bridge alignment was under shallow water either part of the day or all the time. Except for the narrow navigation channel, there was insufficient water depth available for marine barges and equipment to carry out continuous construction work.

The geotextile tube solution allowed the use of locally available sand to replace rock for the reclamation and containment dike construction work, reducing both construction costs and time.

> The work platforms, together with the geotextile tubes, will eventually be embedded within a future land reclamation that will enlarge the Dinh Vu Development Area.

A confirmation of this solution came when the geotextile tubes survived a direct hit by Typhoon Kalmaegi during construction in September 2014.



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