Secumat®

Embankment with
Desert Skin System

Project name
Al Batinah Expressway, Oman

Client/Installer
Construck Systems and Technology LLC, Muscat, Oman

Product
Secumat® 401 20/20 Q1

Naue

Fig. 1: Installation of reinforced Secumat®

Fig. 2:
Steps of installation: 1. Levelled surface 2. Secumat® 3D Mesh 3. Concrete fill

The Al Batinah expressway is a strategic infrastructure project which connects Muscat expressway with the border crossing at Khatmat Malaha to the United Arab Emirates. The expressway is a meaningful connection; it passes close to the highly frequented port of Sohar, which manages more than a million tons of sea freight weekly.

Challenge

With a length of 256km, the Al Batinah expressway is an eight-lane motorway costing more than 800 million Omani Rials, which is more than two bln. Euro. It crosses through challenging terrain, which required the construction of elevated embankments, connecting no less than 17 overhead bridges and 25 wadi crossing bridges. The slopes of such embankments were traditionally protected against erosion with grouted rip-rap.

However, the enormous quantities of stones required in a grouted rip-rap solution, with a significant environmental impact for extraction and transport and additionally a very tight execution schedule, made the rip-rap undesirable. Furthermore, the complicated soil structure, the motorway's length, and the desired construction time of 6 years required a better solution.

Solution

The alternative to the grouted rip-rap was to use a thin layer of semi-dry concrete reinforced with fibres, supported by the firm structure of Naue's erosion control system Secumat®. The monofilament core of the Secumat® was supplementary reinforced with a high modulus biaxial geogrid to reduce deformations and limit the formation of hairline cracks in the concrete. Therefore, the Secumat® was rolled out at a smooth excavation surface and fixed with pins to the subsoil. The concrete for the filling was prepared on-site by the specialized company German Concrete. It was cast in thin layers of only 40mm in thickness which, once cured, became the protective layer against erosion known as the „Naue Desert Skin System". Skilful workers of the contractor Construck Systems and Technologies spread the concrete uniformly within the 3D Mesh labyrinthic structure of the Secumat® randomly oriented monofilaments. They embossed the surface afterwards to give the visual impression of rip-rap anti-erosion protection.

For the construction of the Al Batinah expressway on Package 2 from km45+550 to km90+300, this Naue Desert Skin System proved to be not only more cost-effective than the grouted rip-rap alternative, but it was as well significantly faster to install. The solution performs successful, with over half a million square meters of the Secumat® Desert Skin System installed over three years. Instead of the expensive grouted rip-raps, the Naue solution allowed the project's finalisation significantly faster than planned.

Fig. 3: Secumat® installation

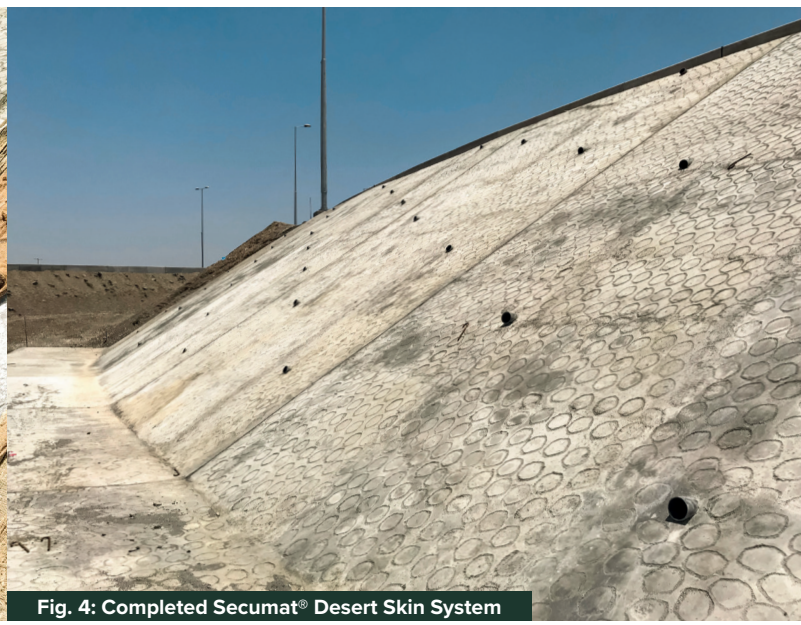

Fig. 4: Completed Secumat® Desert Skin System