Secutex® H

Rehabilitation of a
historic navigable canal

Project name
Sulina Canal Rehabilitation near Maliuc, Obretin, Romania

Construction company
Reinhold Meister GmbH, Hengersberg, Germany

Designer
Iptana SA, Bucharest, Romania

Consultant
Louis Berger & Tractebel Engineering SA, Bucharest, Romania

Product
Terrafix B 813
(New name of the equivalent product: Secutex® HB 751)

Naue

Fig. 1: Reshaping and heightening of the flood prevention dykes

Fig. 2: Unrolling of the sand mat on the banks

Sulina branch is the shortest and the straightest canal of the Danube Delta and is the final part of the Rhine/Meuse-Main-Danube transport corridor, which connects the Rotterdam port at the North Sea with the Sulina port at the Black Sea. It has a length of approximately 71km, and it is the only navigable canal of the three through which the Danube flows in the Black Sea. The construction works to make the canal navigable for sea ships started in 1856 under the supervision of the European Commission of the Danube. They were finalised in 1861. Nowadays, the canal allows the navigation of sea ships with a draught of up to 7.2m and requires permanent maintenance to maintain its navigability.

Challenge

The Sulina Canal crosses the Biosphere Reserve of the Danube Delta – an environmentally sensitive area with many protected species of fish, mammals, birds and plants. The canal was affected both by erosion of the banks – due to the navigation of large ships and by floods generated by increased levels of the Danube River, which became more and more frequent due to climatic changes. The erosion problems needed to be addressed because the navigability of the canal was endangered. As well, works for the reconstruction, reshaping and heightening of the dykes were necessary to alleviate the effects of the floods on the human settlements in the vicinity of the canal.

The initial technical solution involved a classic design including three layers of stones, with masses from 20kg to 1t and fascine mattresses which should have been installed in challenging flowing water conditions. With the quarry located tens of kilometres away from the site and with transport only possible by barges, bringing the large amounts of stones necessary for the rehabilitation works of the Canal was a massive challenge. It was also a big challenge to harvest the fascines and assemble them on the banks as mattresses, ready to be installed. Not only they were not easily available, but the time needed to build the mattresses was significant, and so was the challenge to drag them from the banks in the canal, where the water was flowing at 0.6-0.9m/s, and sink them in position.

Solution

Well aware of the challenges of the location and the existing design, Naue proposed and successfully implemented a value-engineering solution meant to reduce the quantities of stones used and allow a quicker installation of the filter element of the revetment and its stone protection. Whereas the initial solution used a 400g/m² geotextile, which would have been almost impossible to sink and unroll precisely in flowing water and which had to be covered with three layers of stones with different dimensions, the solution proposed by Naue was based on the tried and tested Terrafix B 813 (new name of the equivalent product: Secutex® HB 751) sand mat, a self-sinking multi-component filter geotextile. Not only that this material did not require an immediate cover with stones to keep it in place underwater, but it could also resist stones of 1t laid on its surface without the risk of mechanical damage. Therefore, by using the sand mat, it was possible to replace the filter geotextile as part of the fascine mattresses and eliminate two layers of stones, significantly improving the design.

The first use of a sand mat in Romania was a big success. More than 390,000m² were installed between September 2009 and November 2012. The use of the sand mat allowed an essential reduction of the quantities of stones used, saving both costs and reducing the generation of CO_2 due to the extraction from quarry operations and transport.

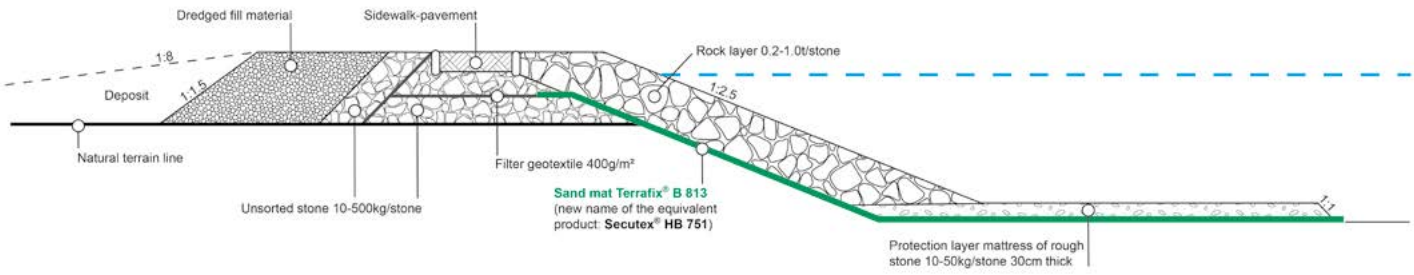

Fig. 3: Execution drawing