

# ARROYO ENTRÍN VERDE ESTREMADURA, SPAIN

## Bank protection with Incomat® Flex



Arroyo Entrín Verde covered with Incomat®

### Situation

In 2008, the Spanish engineering consultant INPROESA, designed and planned the bank protection of the Arroyo Entrín Verde, near Entrín Bajo in Extremadura. Flow velocities of up to 6 m/s resulted in a higher risk of bank collapse. The slope inclination of the trapezoidal flume was 1:2. In cooperation with the department of hydraulics and waterways of the government of Extremadura, the decision was made to install Incomat®, a geosynthetic concrete mattress system as an erosion protection solution.

### Solution

The project was executed in August 2010 by the working partnership of INCOHERSA and VICTORIANO SEPÚLVEDA E HIJOS

In order to keep hydraulic continuity between the groundwater table and the water level in the river, the permeable mattress Incomat® Flex was used. The mattress consists of two layers of synthetic fabric, which are internally connected by spacing binders. The internal space is filled with pumped fine aggregate concrete. Filterpoints are arranged regularly, ensuring water permeability. The woven layers operate as a lost formwork during the concreting process. Thus the installation process is simplified and the construction period is decreased.



Arroyo Entrín Verde before start of construction

The determination of the required mattress thickness, according to the design approach of K.W. Pilarczyk, was undertaken in cooperation with HUESKER's Engineering Department. The decisive factors were geometry, subsoil conditions and hydraulic loads.



Detail Incomat® Flex

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Installation of non-woven and Incomat® Flex

The fabric formwork was delivered in prefabricated panels, consisting of 8 to 10 webs of 5 m width, which were joined together by seams.

After the preparation of the slope surface (clearing and leveling), the slope was covered with a non-woven geotextile (500 g/m<sup>2</sup>), in order to guarantee the long-term functionality and the hydraulic effectiveness of the filterpoints. The Incomat® Flex panels were then installed and temporarily fixed at the top of the slope, to ensure the mattress position during the concreting process. After filling with mortar, the permanent anchorage detailing both - at the crest and toe were constructed. Adjacent panels were overlapped by 0.5 m.

Incomat® combines experience and technological development from projects executed over more than 40 years. Once that time, Incomat® has been installed successfully in many hydraulic projects in coastal areas, rivers and channels or for sealing of reservoirs.

Location: Entrín Bajo, Extremadura, Spain

Constructor: Government of Extremadura

Execution planning: INPROESA

Construction: INCOHERSA, VICTORIANO SEPULVEDA EHIJOS

Year: 2010

Products: Incomat® Flex



Filling with mortar



Embankment under construction

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