

TECCO®
Slope stabilization system



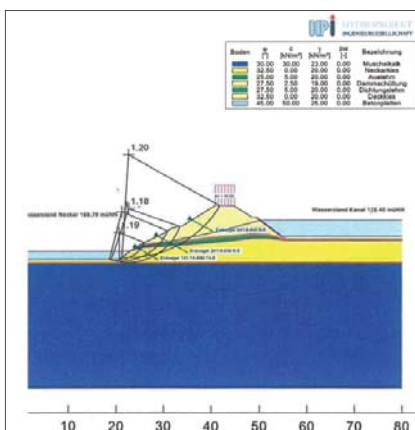
**Repairs to a reach dam using TECCO® steel wire mesh and pillar
Neckar Federal Waterway, fall at Besigheim / Germany**

TECCO® Slope stabilization system Fall at Besigheim / Germany



Aerial photo of the dam (extract from Google map; red line = construction zone)

Object:	Reach dam at the Besigheim fall, Neckar Federal Waterway / Germany
Action:	Slope stabilization
Method:	Slope nailing using TECCO® steel-wire mesh and pillars
Components:	820 principal nails, WT 32 / 5-6-7m long 480 intermediate nails, WT 28 / 4m long 8'200m ² surface stabilized with TECCO® and erosion protection mat 1'131 TECCO® pillars, Ø 50cm, 3.5m long
Promoter:	Ministry of Waterways & Shipping, Stuttgart;
Action planning:	Hydroprojekt Ingenieurgesellschaft, Munich; Ministry of Waterways & Shipping, Stuttgart; Federal Waterways Engineering Institute, Karlsruhe
TECCO® component planning:	Geobrugg AG, Romanshorn, on behalf of Königl GmbH & Co. KG, Würzburg
Dimensioning:	Hydroprojekt Ingenieurgesellschaft, Munich; Rüegger Systeme AG, St. Gallen
Structural testing:	Prof. Dr. -Ing. B. Fröhlich, Limburg
Execution:	Königl GmbH & Co. KG, Würzburg; Erwin Müller Spezialtief- und Wasserbau GmbH, Neckarzimmern
Period:	Autumn 2006 to autumn 2008



HPI dimensioning statement

Situation

At the Besigheim fall the course of the Neckar is separated from the canal to the gate by a dam. Water level differences can be up to ca. 6.6m causing flow towards the Neckar at high water. The increased drag stresses during high water flow have an abrasive effect on the footing zone of the dam.

Comprehensive investigations of the overall stability near the surface in the dam footing zone have indicated that in the present state the flank turned towards the Neckar is no longer sufficiently stable.

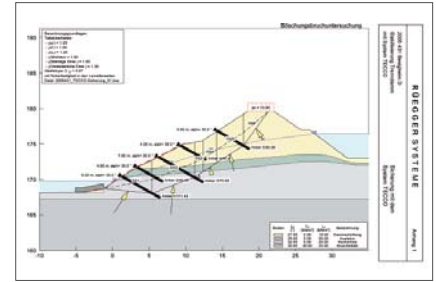
Local boundary conditions and the stability assessment of the reach dam necessitated the use of slope nailing with stabilization over the entire slope surface. Due to the required permeability and the underwater construction, all-over surface stabilization and the construction of the nail heads could not be executed using shotcrete technology.

The optimal alternative proved to be slope nailing using high tensile steel wire mesh, erosion protection mats and geotextiles. However, as the unstable footing zone is in the water, that part could not be nailed. The alternative solution was to stabilize the foot of the slope with steel wire mesh pillars filled with coarse gravel protecting against colmation and erosion.

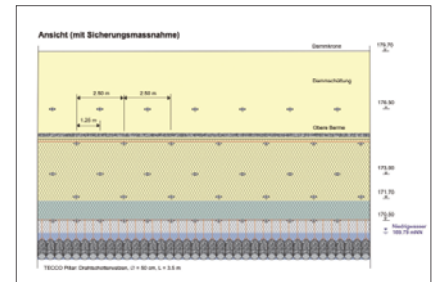
Stabilizing concept

Based on stability investigations carried out by the civil engineering firm HPI-Hydroprojekt in Munich, the overall stability of the dam flank towards the Neckar can be guaranteed by using three rows of nails with nail lengths of 5 - 7m, taking into account an unfavorable flow. The TECCO® slope stabilization system dimensioned on the basis of the RUVOLUM® concept was used to stabilize instabilities close to the surface. Two additional rows of 4m long nails were inserted to adequately brace this system against the surface.

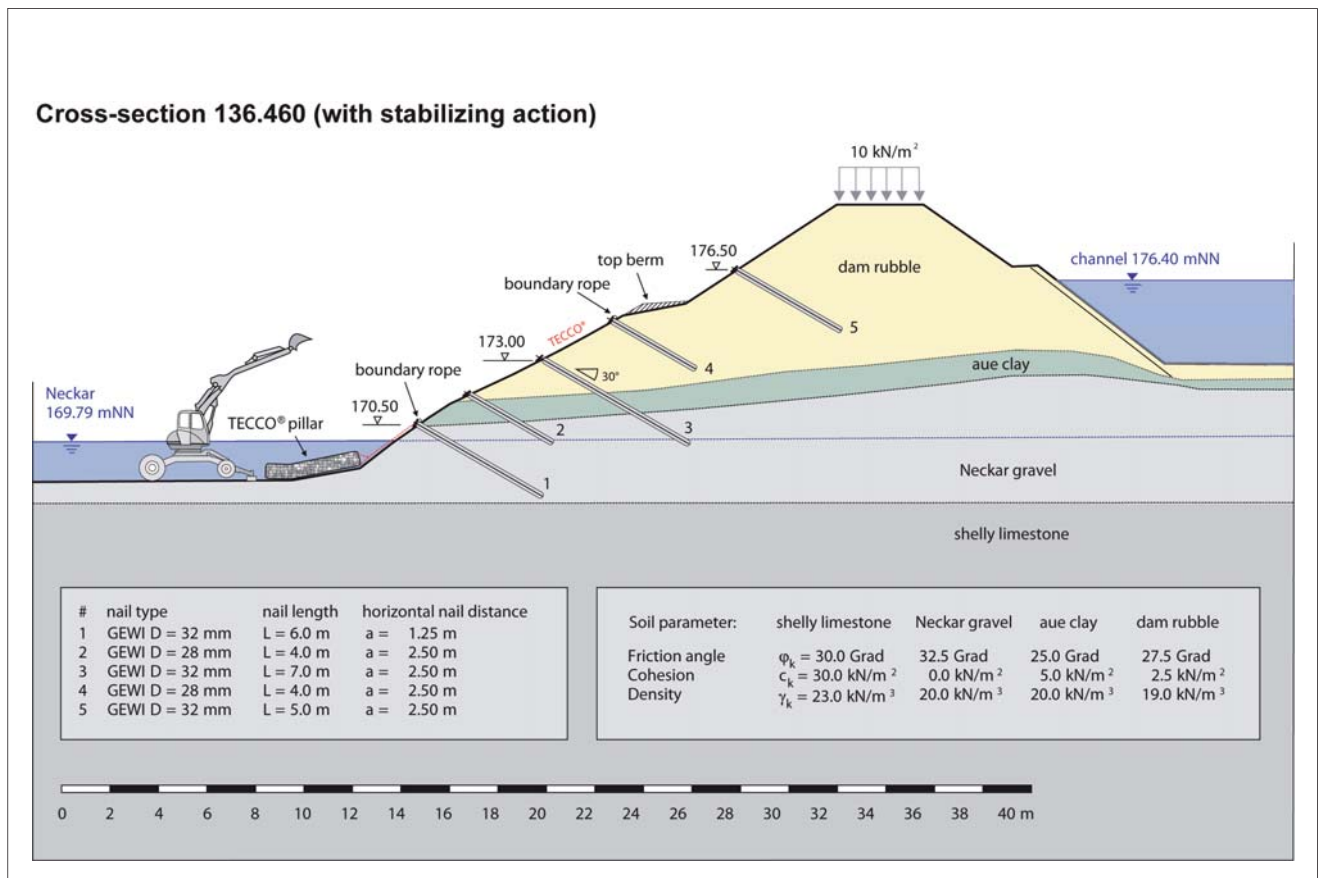
Due to the special boundary conditions specific to the project, the footing zone situated in the Neckar river bed was covered with stone filled steel wire mesh pillars. Hence, colmation and erosion can be counteracted in addition to a favorably acting loading of the dam footing. The stone filled wire mesh pillars were designed to be dimensionally stable, but were flexible enough to have adjusted themselves optimally to the small scale changeable supporting surface.



RUV / GGU dimensioning statement



Overview of the stabilizing concept in the slope cross-section



Drilling work



Anchor check



*Slope stabilizing using high tensile
TECCO® steel wire mesh*





Empty pillar baskets prior to filling

Left: Pillar production at Besigheim



Pillar filling in vertical shaft, sealed by a cover with connecting bearing



Shipping the pillars to their final destination



Preparing the TECCO® mesh for placing under water with a mobile raft



Submerged TECCO® mesh below the water level



Unloading the TECCO® pillars



Divers assisting with the pillar placing



Fully stabilized dam





Rockfall barriers

Rockfall drapes

Slope stabilization systems

Debris flow barriers

Avalanche prevention structures

Open pit rockfall barriers

Special applications

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It is the task of our engineers and partners to analyze the problem together with you in detail and then, together with local consultants, to present solutions. Painstaking planning is not the only thing you can expect from us, however; since we have our own production plants on three continents, we can offer not only short delivery paths and times, but also optimal local customer service. With a view towards a trouble-free execution, we deliver preassembled and clearly identified system components right to the construction site. There we provide support, if desired, including technical support – from installation right on up until acceptance of the structure.



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