LABORATOIRE DE CONSTRUCTIONS HYDRAULIQUES

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

Flood diversion structure on the Worble River - scale model tests (2001)

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Study entrusted by the village of Ittigen, represented by IUB consulting engineers Ltd in Berne

Introduction

Inundations of urban areas during the passage of large floods are frequently responsible for damages with significant economic consequences.

Such a situation exists in the village of Ittigen, close to the city of Bern, where the capacity of the Worble River is currently insufficient regarding flood protection objectives. To solve this problem, IUB consulting engineers in Berne elaborated the project of a flood control structure before the entry of the endangered zone. The diverted discharge is rejected directly into the Aare River, natural outlet of the Worble.

Structure to be studied

The proposed structure, conceived on the principle of a Tyrolean intake (Fig. 1), allows limiting the downstream discharge by diverting the excess flow through a gallery. It is composed of the following elements:

- An approach flow channel
- A discharge limiting orifice
- A safety sill
- A dissipation chamber
- A diversion gallery

The problems to solve were the optimal intake of water and simultaneously, the elimination of major floating and solid debris.

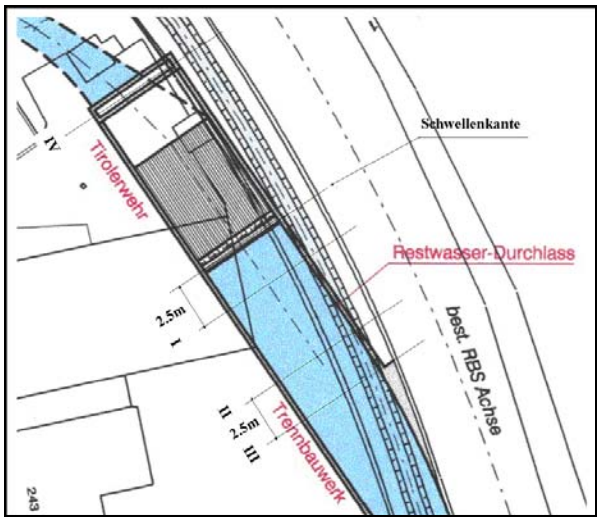

Fig.1 : Situation map with the flood diversion structure on the Worble River

Objective of the study

The purpose of the study was to develop the design bases of this type of work by a parametric analysis of its main characteristics. This analysis has been performed on an experimental and theoretical basis.

Scale model tests

The tests performed on a physical model of scale 1:15 (Figs. 2-4) showed that the solution proposed by the engineer functions to satisfaction subjected to some adjustments on the orifice for minimum discharge control, as well as on the exceeding discharge control sill, on the floating debris retention trash rack and the support slab of the gallery entry.

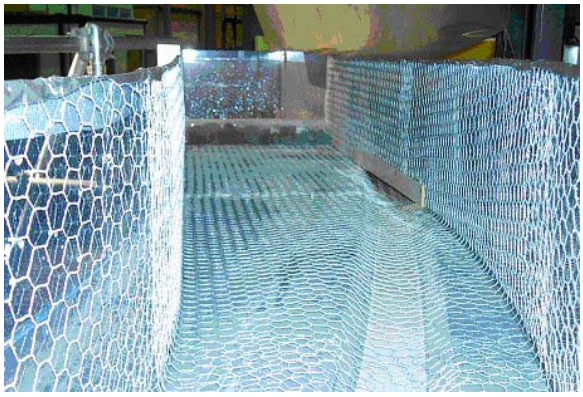

Fig.2 : · An approach flow channel with artificial roughness using a metalic net

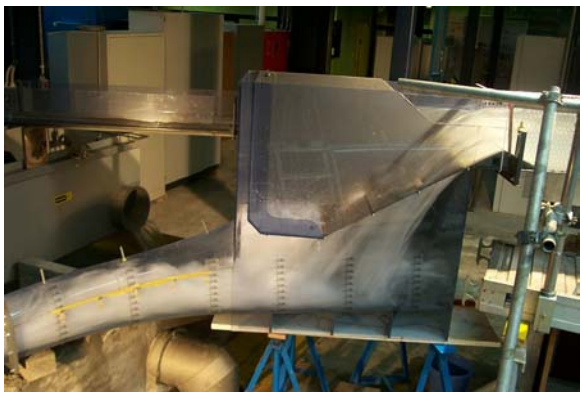

Fig.3 : Flow at the entrance of the gallery, Q = 50m^3/s

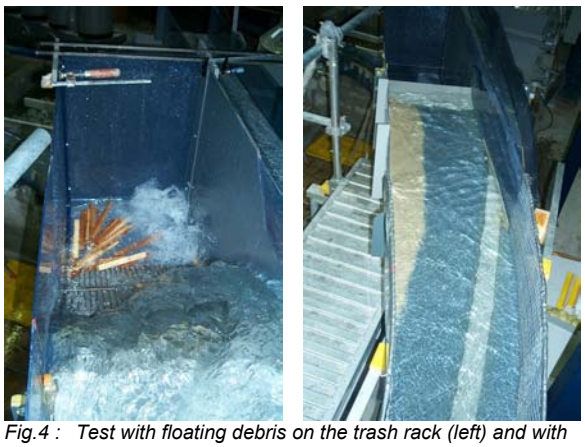

Fig.4 : Test with floating debris on the trash rack (left) and with sediment deposits upstream of the weir (right)

Conclusions

Thanks to these minor modifications, the objective to improve the flow distribution on the control sill and therefore at the entry of the evacuation gallery has been reached.