

THE NEW FOOTBRIDGE IN CITY OF CRACOW

DYNAMIC DESIGN AND FINAL VERIFICATION IN TEST LOADING

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Summary

The paper presents design evolution of the footbridge, from architectural form through basic design to finally built structure. The footbridge over the Vistula River just built in Cracow, was selected by the City Authorities as a result of international competition. The winning project was destined to execution. During the early constructing stage many changes were implemented to the basic design. Predictable dynamic behaviour of the superstructure was one of the major targets in this stage. Assumptions, structural changes and numerical simulations performed by the designing team are presented here. Finally, a dynamic test was carried out to verify the assumptions. Theoretical base, methodology and final conclusions are included.

Keywords: footbridge; dynamic; structural concepts.

1. Introduction

The just opened new footbridge over the Vistula River in Cracow is a result of evolution from aesthetic design to the final engineer structure ready to carry pedestrians. The history of the designing process and detail explanation of the structure is presented by the authors elsewhere in conference proceedings. The following paper presents general principia of structural changes implemented after the basic design, dynamic analysis and related to dynamic design effects.

2. Design

2.1 Evolution of Structural Concept

The footbridge was designed as an arch span (span $L=143\text{m}$, arch camber $F=15,34\text{m}$ – fig. 1), supported on special abutment prepared to carry full horizontal load. The horizontal structural grid consisted of longitude concrete carriageways and cross pipe beams was hung to the arch by vertical (in elevation view) steel rods. The superstructure was placed on abutment made from plies (partly highly inclined).

The basic reason to modify the design, came from the contractor who found enormous problems with execution of the abutment structure. In effect the contractor organised a specified additional consulting team, ready to study the problem:

- Promost Consulting Rzeszów – conception works, detailed design of alternative solution for the abutment and the superstructure.
- KBP Żółtowski – conception of alternative superstructure, dynamic analysis and verification of detailed design.
- ZB-P Mosty Wrocław – consulting.

In the early stage of analytic work several problems were indentified - with abutment, dynamics and technology of the erection. Finally, the following issues were identified:

- Problems in the abutment structure as a consequence of unfavourable static system and structural solutions.