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Cable-Stayed Mariansky Bridge in Usti nad Labem

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Summary

A paramount question for mankind in the next millennium is the quality of environment in which we will live. The most important components of the environment, clean air, water and soil, are impacted by transportation. Making transportation efficient and environmentally friendly often requires a sophisticated infrastructure, of which bridges are the most noticeable part. The cable-stayed bridges with its pylons are one of the most dominant and preponderantly used structural forms of the modern era. The shaping of its pylons and the arrangement of its cables is very important for the overall conceptual design. The resulting successful work should be a quality structure resulting from an optimal balance of economics, appearance and suitable structural design. The designers of the new cable-stayed bridge in Usti n. L. tried to follow this path with the pursuit of quality in the design and the construction, with focusing on the function and the aesthetics.

1. Conception of the Design

On July 30, 1998 a new bridge was ceremonially opened in Usti n.L. in the presence of important people from the Czech Republic and abroad. This bridge project was very important for the city since it had spread out along both sides of the river, with only one old road bridge connecting both banks. The City of Usti nad Labem could not count on the help of the Czech Government to finance this new bridge, so it decided to finance it independently. These circumstances are important reasons why the city put so much emphasis on the appearance, aesthetics, and structural consequences of the bridge. The resulting structure confirmed the importance of those aspects.

For a variety of reasons, the bridge had to be located opposite a massive cliff on the left bank. On the right bank the bridge connects to pre-existing infrastructures - a road bridge over railroad lines and a road traffic circle. Construction space was thus limited on both sides - on one by a natural geological formation and on the other by pre-existing structures. The location of the bridge in the middle of the dramatic surrounding terrain to a certain degree presented a challenge to the authors of the final design (Milan Kominek and Roman Koucky) and had an impact on the conceptual design. At the beginning of every successful bridge project should be clear conception of the structural design including construction method. The following criterias had major influence on the design of this bridge.

The first basic idea of the conceptual design was to minimise the mass of the bridge ramps below the Marian Cliff and the main cable-stayed span and to move all the structurally necessary mass to the right bank opposite the mass of the cliff. This led to the idea of a single inclined pylon that would correspond to the angle of the inclination of the cliff (Fig 1).

The second basic idea of the conceptual design was to avoid using backstay cables in order to keep the space on the right bank as open as possible, given that is already constricted by the existing road

network. The 123,3 m-long main span was designed in steel to minimise weight. This span length and the shape of the pylon made it possible to transfer the forces caused by the cables-stayed main span without recourse to back stays in the back span (Fig 3). If the main span about 15 m longer, the masses and shape of the pylon would not have been so favourable, and with an even longer span it would be necessary to use backstays, and the shape of the pylon would have been different.

The third basic conceptual idea was the balancing of forces between light main span and stiff back span. The shortened back span, with the pylon serves as a statically stabilizing

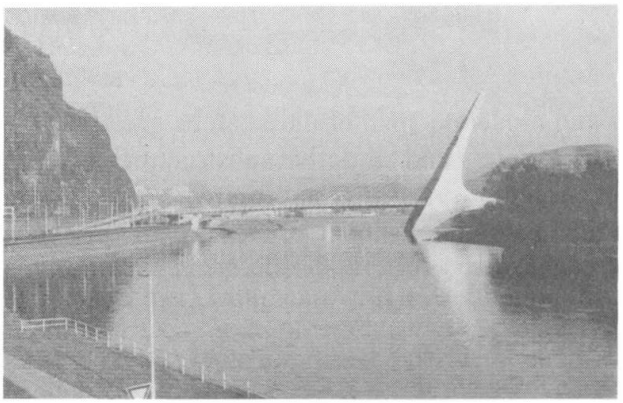

Fig. 1 Longitudinal view

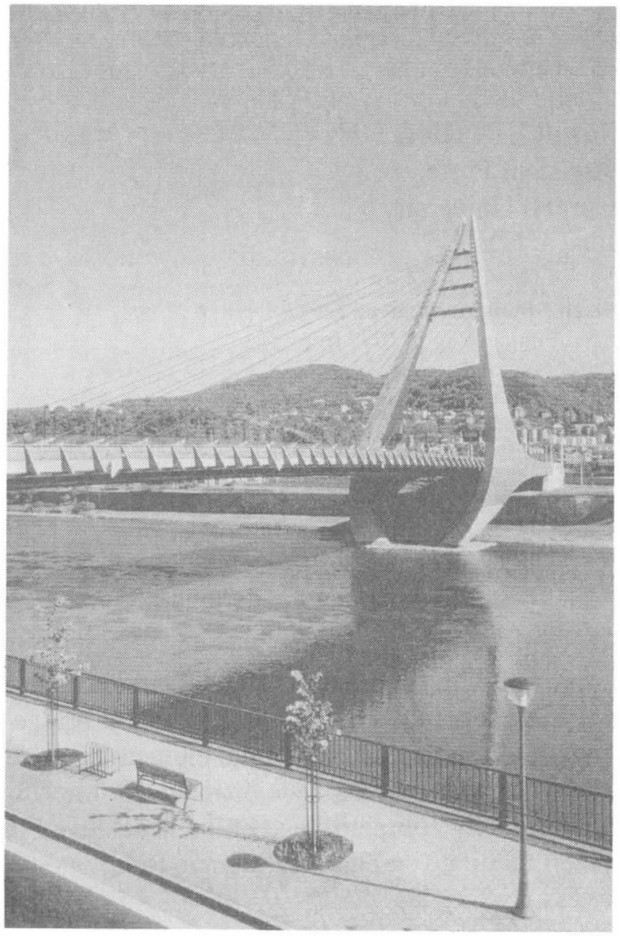

Fig. 2 View from the Marian Rock

part of the structure. The gentle curve of the main suspended span across the river originates from the structural demands on the back span (Fig 2). The fourth basic conceptual idea focused on the construction method. The back span with the pylon as a fixed part of the bridge was considered from the beginning as an important part of the structure for the method of construction to serve after its erection as the base from witch the remaining superstructure of the main span would be constructed because the only available space for the building yards was on the right bank.

2. Conclusion

Bridges are part of the cultural heritage of mankind and are testament to human skill. They were as indispensable in ancient times as they are today. Their shape can be strictly functional, common, or on the contrary, unusual. But the one thing they all have in common is that they are all products of their environment and each shows the specific circumstances and limitations of the time of its creation and the effort and will of the people involved.

In the case of the Marian Bridge it was on one hand the close cooperation of the bridge and traffic engineers with the architect and on the other hand the will of the city to build the bridge, which has next to the medieval castle become a new symbol of the modern era as a part of the environment and everyday life of city residents and its visitors.

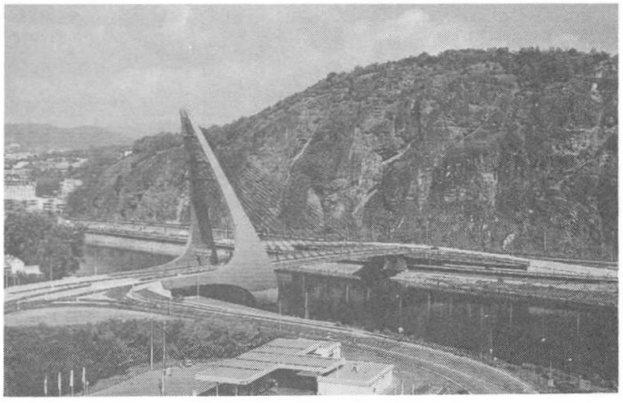

Fig. 3 Overall view towards the Marian Rock