

Modernization of Historical Bridges – Environmental Aspects

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Summary

In many countries, old bridges represent a relatively great part of bridge population. Many of them are of bigger or smaller historical value, influencing also the environment. Their utilization is in many cases technically and economically justified. However, they usually require repair, rehabilitation and/or modernization to meet the contemporary traffic conditions. The above operations demand the application of special methods which should be environmentally friendly as well as technically and economically effective for bridge durability. They should also assure the conservation of historical and aesthetical values of the old bridges. All the problems described above have been discussed and exemplified in the paper.

Keywords: old bridges, historical values, rehabilitation, modernization, environment.

1. Introduction

Old bridges with bigger or smaller historical value represent a relatively great part of bridge population in many countries, including Poland. In the majority of cases, their utilization is technically and economically justified. Moreover, the influence of the old bridges on the environment is often very important. However, they usually require repair, rehabilitation and/or modernization, including widening, structural strengthening, etc., to meet contemporary traffic conditions and load-carrying capacity. The above operations demand the application of special methods which should be environmentally friendly, technically and economically effective for bridge durability. They should also assure the conservation of the historical and aesthetical values of bridges, including their original appearance (i.e., architectural form) and their influence on the landscape.

2. What is a Historical Bridge?

It is practically impossible to find the answer to this fundamental question. Different aspects, as for example formal regulations or local or national tradition, or both, can be taken into account while formulating the definition of a historical bridge. Moreover, irrespectively to the factors mentioned above, the classification of bridges into the historical group is always more or less subjective.

Some fundamental criteria related to the classification of old bridges into the group of historical ones are formulated on the basis of Polish official regulations.

3. Historical Bridges in Poland

Classification of the historical bridges officially included in the National Register of Historical Objects is presented in a graphic form. Historical bridges are classified according to a structural material, function and age.

4. Modernization of Historical Bridges

General problems concerning modernization of historical bridges are presented and exemplified. Strengthening and widening of old bridges with various historical values are classified according to four situations (strengthening) and nine situations (widening) which correspond to the fundamental cases in engineering practice.

Environmental aspects of bridge modernization are also presented and classified into two main groups: social aspects, which include many direct and indirect problems concerning human life and its standard, and architectural and landscape aspects, which influence the environment.

Architectural and landscape aspects are classified into two sub-groups: the old bridge is of high historical value but its surroundings are of medium or low historical value, and the bridge itself is not of high historical value but it is located in the historical area preserved by the relevant official regulations.

5. Case studies

All the problems concerning modernization of historical bridges (see p. 4) are exemplified by the real situations which occurred in Poland in the last years. Two cases are presented in detail.

First case concerns the arch concrete viaduct built in 1904 in Warsaw and restored in 2006. All the technical and modernization operations, including bridge strengthening with prestressing tendons and changing geometrical parameters of carriageway and side walks, as well as conservation works are listed and photographically exemplified.

The second case concerns the bridge of rather low historical value, built in 1939 in Sochaczew, central Poland, but located in the historical area preserved by the relevant official regulations. The restoration of the bridge is economically and technically unjustified but its removal is not officially allowed. The controversy between the engineering and social needs on one side and the official legal regulations on the other is pointed out.

6. Concluding Remarks

Modernization of historical bridges is a serious technical, economical and social problem in many countries, including Poland. In the paper only some aspects of this multi-factor and complex problem are presented and exemplified. Moreover, the legal obstacles concerning the modernization of old bridges are shortly described. As the problem of adjusting bridges to the changing traffic requirements is more and more common in many countries, the changes in official regulations seem to be necessary.