

Experience of Cable-Stayed Bridge Analysis

by

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Abstract

Cable-stayed bridge analysis is becoming a problem that engineers have to solve more often nowadays. Institute Giprostroykost Saint-Petersburg works on three cable-stayed bridges, including the bridge of 1100 meter long central span which will be the world's longest one.

As a rule, cable-stayed bridges require time-consuming non-linear analysis. In order to perform the design faster the structural parameters should be properly determined at preliminary stage of linear analysis. Most of all, the structural parameters are dependent on cable forces. Specifying various values of the forces the engineer can affect the stress-strain-state of the structure. Thus, we should determine the cable forces according to some design criteria.

The principal analytical criteria are to achieve the following bridge conditions: the deck should be in specified design position and the pylons should be vertical. But if we set a problem in that way we would get unacceptable results due to numerical instability of resolving equation system.

Therefore it is necessary to find out new criteria equivalent to the basic ones and resulting in an appropriate solution. There are several possible variants of problem definition such as specifying either the cable forces according to deck self weight, or bending moment diagram, or shear forces, or some combined approaches.

However this way requires additional calculations in order to define proper diagram shape and regulate the distribution of cable forces. According to our experience, the best results can be achieved using the moment diagram method that will be discussed within the presentation.