



Control of dimensioning and investigation of the bridge for crossing a strait in Estonia

Valdek Kulbach

Prof. Emeritus
Tallinn University of
Technology
Tallinn, Estonia
vkulbach@edu.ttu.ee

Valdek Kulbach, born 1927, received his civil engineering degree from Tallinn University of Technology. PhD degree from Polytechnic Institute of Sankt-Petersburg. DSc degree from TUT.



Egon Kivi

Doctoral Student, MSc
Tallinn University of
Technology
Tallinn, Estonia
egon.kivi@mail.ee

Egon Kivi, born in 1978, received his BSc and MSc from TUT



Summary

The strait crossing between the Estonian mainland and the islands Muhu and Saaremaa represents the most important project for the nearest decades in Estonia. Department of Structural design at TUT started with active work at the project in 1990. Our activities were directed to preliminary design of the overpass as a whole and especially to the central navigable part of the bridge. The main attention was paid to theoretical investigation and hybrid structures. Both continuous and discrete nonlinear calculation models were used.

Keywords: suspension bridge; girder stiffened cable; self-anchored bridge; hybrid system; continuous analysis; discrete calculation; model testing; anchoring cables.

1. Introduction

1.1. General data of the link and the bridge

The overpass from Estonian mainland to the island Muhu has the overall length about 6100 metres, it consists of the central part of 120 + 300 + 120 m, the composite continuous girder structures of approach bridges with the total length of 3460 m and the causeways about 2100 m. Our main attention has been paid to the structures for the central span with the cable-supported structures.

Due to the clearance in height of 35 meters for the navigable span, the maximum level of the bridge deck was taken +40.00 from the sheet of water. The longitudinal slope of the bridge deck was chosen on the ground of the condition of the fluent transition from the mainland highway to the navigable part of the bridge; the maximum local slope on the transition area was 4%.

The total width of the bridge deck for preliminary design was taken 13 meters. It corresponds to the second class of bridges, determined by Estonian designing codes. The total width consists of the bridge road (two traffic lines of the 3.75m) and two safety trips 2.75 m; the latter may be used not only as overpass for pedestrians and cyclists, but also for location of vehicles, forced to stop on the bridge.

Due to complicated estimation of the bridge behaviour under the action of fluctuating wind load the ultimate design is to be impended by thorough theoretical analysis and the wind tunnel tests. Due to serious ice action and possible ship collision, corresponding risk analysis is to be done.

Control of dimensioning of the suspension structures was carried out by means of the continuous method of analysis published in our former reports [3, 4, 5, 6].

1.2. Research presented in paper

The paper presents description of bridge model under investigation and the problems of preliminary design and analysis.