



Modelling the Construction of Cable Stayed Bridges Stressed with the Strand by Strand Technique

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Abstract

The temporary supports erection method is the most common way of building cable-stayed bridges. In this technique the bridge deck is first built over a set of temporary and permanent supports. Then, during the tensioning process, the stays are successively placed and tensioned by the jacks and the deck is raised from the temporary supports. Several variants of this method are the launching of the bridge and the rotation method. This paper proposes an algorithm to calculate and to control the construction of such bridges when the strand by strand tensioning technique is used. It is based on the unstressed length of the stays concept. The use of such concept enables a fast and direct simulation of construction stages by analysing independent Finite Element Models. As there is no need of superposition of models it is a very convenient way for construction supervision.

Keywords: Construction Simulation, Cable-Stayed Bridges, Temporary supports, Tensioning Process, Analysis, Unstressed Length.

1. Introduction

The temporary supports erection method is the most common way of building cable-stayed bridges. In this technique the bridge deck is first built over a set of temporary, T , and permanent supports, P . Then, during the tensioning process, the stays are successively placed and tensioned by the jacks and the deck is raised from the temporary supports. Several variants of this method are the launching of the bridge, used in Millau Viaduct, and the rotation method, used in the Ben-Ahin Bridge. The main advantage of the temporary supports erection method is that conventional construction techniques may be used and therefore, both, construction cost and period can be significantly

reduced compared with its opposite erection technique, the cantilever method, which is used when the site requirements prevent the placement of temporary supports during construction. For this reason, this is usually the most common technique in the construction of the cable-stayed bridges all around the world. In the cantilever erection method, as its name states, the bridge is built by means of the placement of deck segments in cantilever. These segments are supported by stays located in the alternative sides of the pylon. This erection technique has been studied by many researchers.

The analysis of cable-stayed bridges is much more complicated than the analysis of other structures.