CABLE NET BRIDGE CONCEPT

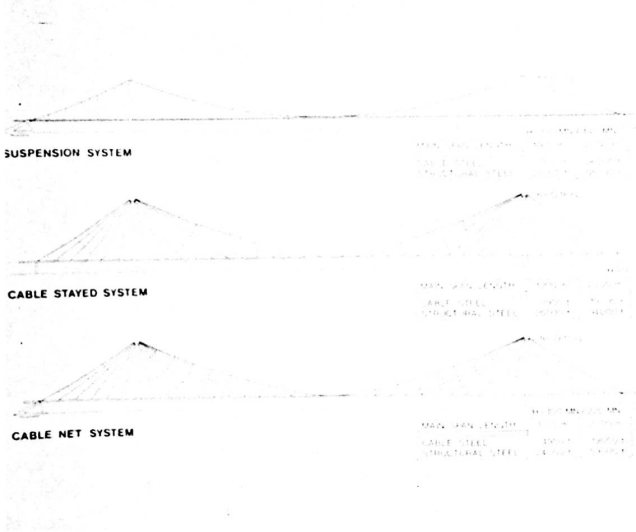
CONCEPTUAL DESIGN FOR AN EFFECTIVE LONG SPAN CABLE SUPPORTED BRIDGE

LS J GIMSING
ESSOR

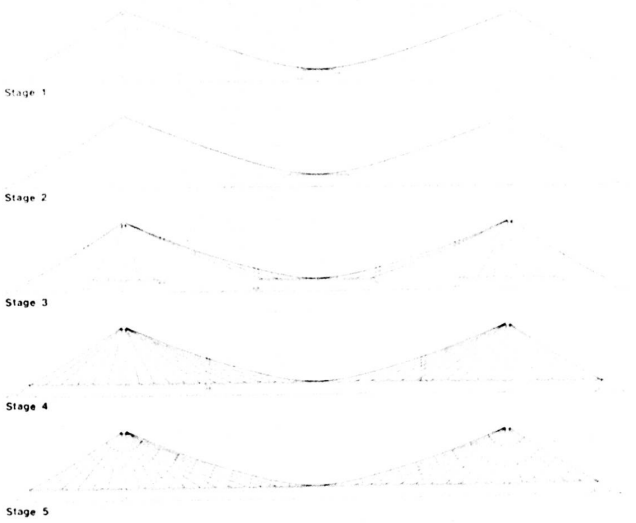
F STRUCTURAL ENGINEERING
CAL UNIVERSITY OF DENMARK
ngby Denmark

ING & MADSEN LTD
SULTING ENGINEERS
ade 11, 2700 Hørsholm Denmark

COMPARISON



ERECTION



CABLE NET BRIDGE CONCEPT

Niels J. Gimsing
Professor
Department of Structural Engineering
Technical University of Denmark
DK 2800 Lyngby, Denmark.

Within modern bridge building, two systems of cable supporting have been developed: The suspension system with a concave main cable and vertical or slightly inclined hangers, and the cable stayed system with stay cables arranged as a fan shaped, multi cable system.

Of these two systems, the cable stayed system is characterized by the lowest consumption of cable steel, only about 50% of that needed in the suspension system.

Despite this fact, all cable supported bridges with main spans exceeding 450 m have so far been built as suspension bridges.

The main reason for this is undoubtedly the efficient and very stable erection procedure of the earth anchored suspension bridge, characterized by pure tension in all load carrying elements between supporting points throughout the erection period, and by the application of lifting struts supported directly on the main cables and allowing lifts of very large erection units weighing up to 300 tons. In the self anchored cable stayed bridge, erection must proceed by free cantilevering from the pylons introducing compression in the stiffening girder and requiring heavy derrick cranes(with moderate lifting capacity) placed on the bridge deck.

The cable net bridge concept is developed in order to obtain a structure combining the erectional advantages of the earth anchored suspension system and the material saving properties of the cable stayed system.

In many ways, the cable net system is similar to the cable stayed system, both having cables radiating from the pylon top. However, the cable net system differs in 2 important aspects from the cable stayed system: the top cable is continuous across the main span, and the back stay (side span top cable) is anchored to an anchor block instead of to the stiffening girder.

The erection procedure for the cable net bridge can be chosen so that the desired final system is achieved directly without requiring complicated adjustments to be carried out before or after installation of the closing pieces.

The erection of the cable net itself can be based entirely on techniques known from the suspension bridge and the cable stayed bridge erection. To harmonize the erection of the top cable and of the stay cables, parallel wire strands should preferably be used in both operations.

The last stage in the cable net erection is the installation of secondary, so-called trajectory cables that are being stressed under the application of superimposed load from wearing surfaces, railings etc. The trajectory cables significantly reduce the sag variations of the main cables and eliminate individual cable oscillations.