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New Concept used in Construction of Concrete Cable-Stayed Bridges

Nouvelle conception pour la construction de ponts à haubans en béton

Ein neues Konzept für den Bau von Beton-Schrägseilbrücken

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Bridge construction technology is steadily developed, along with 21 concrete cable-stayed bridges have been completed and 5 are under construction in China. On what has already been achieved, we proposed a new construction concept for superstructure of concrete cable-stayed bridges in the preliminary design of Yangtze River Bridge at Huangshi city and Modaomen Bridge over West River at Zhuhai city with main span of 460 m and 240 m respectively. Main features of the concept are:

(1) Formworks and reinforcement works do not take up time in the cycle of cast in situ cantilever construction.
(2) Internal forces of the bridge structure during construction stages are smaller than those due to service load.
(3) Weight of construction equipments is quite small.
(4) Amplitude of internal forces and deflections in bridge structure during construction is very small and can be accurately controlled.

PROCESS OF THE NEW CONSTRUCTION METHOD

Triangular crane I and working platform II are two major equipments used in the new construction method (Figure 1). General concept of the method will be mentioned by introducing how the two major equipments to be used in the construction process of cable No. n and its relative girder segment as follow:

(1) After finishing the construction of segment No. (n-1), triangular crane I hoists the working platform II down to a barge or a trailer which will carry II to the formwork and reinforcement work yard.

(2) Relieve the back stay Ia, move crane II ahead to the construction position of segment No. n, fix the crane longitudinal and transverse position retainer Ib, Ic into the deck of bridge and fix the back stay Ia with a certain tension force.
(3) Triangular crane I lifts working platform II, on which formwork and reinforcement have been ready, from barge or trailer to the design position.
(4) Erect platform longitudinal and transverse position retainer IIa, IIb as well as the back lifting bar IIc, then fix them.
(5) Erect cable No. n and use platform front lifting bar IId, coupler IIe to connect cable No. n to platform II.
(6) fill in the container of working platform with water, weight of which is equal to that of concrete of girder segment No. n. At the same time make the first jacking for cable No. n to keep the deflection of platform within a certain value.
(7) Cast concrete of girder segment No. n while pump out water from the container of working platform to keep the elevation of platform and the force of cable No. n within a certain value.
(8) When concrete of girder segment No. n reaches design strength, make the second jacking for cable No. n. At the same time relieve IIa, IIb, IId, IIe IIc to transfer the cable force from working platform to girder segment No. n.
(9) Turn to the construction of segment No. (n+1).

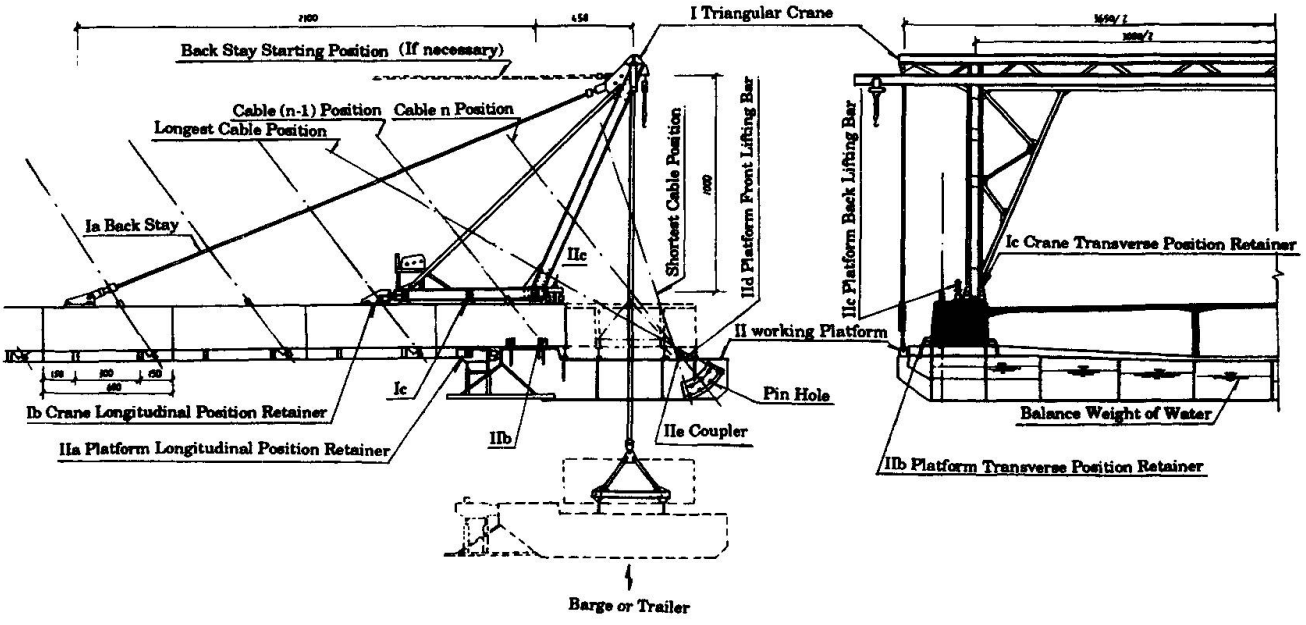

Figure 1. General arrangement of construction equipments