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Artikel: Cable-stayed bridge with new Vierendeel Type girder

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Cable-Stayed Bridge with New Vierendeel Type Girder

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An example of a two-dimensional section model in wind-tunnel.
The results of the experiments of spring-mounted section models on torsional oscillation.
Spring-mounted section models were stable against torsional oscillation. Flutter or vortex excited oscillation did not occur until the wind speed reached 110 m/s. This figure shows V-δ (wind speed --- logarithmic decrement) curves at the torsional double amplitude of 2°. For reference, V-δ curves for ordinary truss-type girders under the same conditions are also indicated.

The maximum and minimum bending moments of a Vierendeel-type girder against the changes in parameter K when a uniform load of 1.0 t/m is applied to the full span. The cross-sectional area of the girder A = 0.240 m^2, the moment of inertia I = 8.5054 m^4; A_t of the main tower = 0.780 m^2; I_t of the main tower = 7.250 m^4; Ac of cable = 0.01893 m^2 (average); and the overall length of the girder L = 884 m.

$$K = EI/L^2EcAc$$

The characteristics of the changes in maximum and mimimum bending moments due to the changes in the flexural rigidity of the girder K, are illustrated. When K is smaller than $10^{-3} \sim 10^{-4}$, the changes in the bending moment are not so remarkable.

The characteristics of the flexural rigidity of a Vierendeel-type girder observed when the flexural rigidity of the vertical members of the girder is changed. When parameters α and β are used, the equivalent moment of inertia of the girder Ie is expressed by

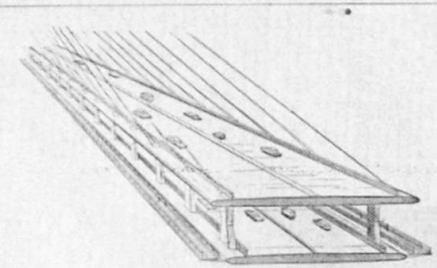
$$Ie = 2Io + \alpha Ao \left(\frac{H}{2}\right)^2$$

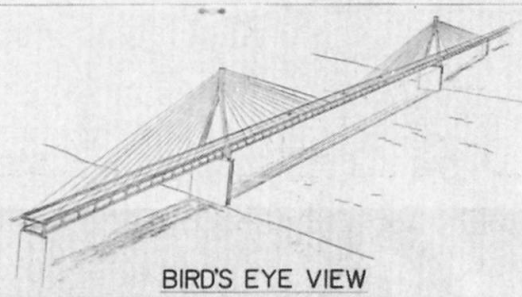
$$\beta = \frac{2Io}{Ie} \times 100\ (\%)$$

Where, Io is the moment of inertia of upper and lower chord members, Ao is the cross sectional area of upper and lower chord members, H is the distance on centers of upper and lower chord members, and α is the equivalent section coefficient.

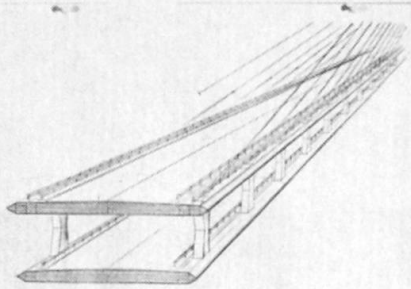
The design concept when the vertical members of a Vierendeel-type girder are connected to a box girder.
The vertical members receive both the bending moment action as the stiffening girder in the plane of the girder and the deformation resisting action of the cross section of the whole stiffening girder in the plane at transverse direction to the plane of the girder. Therefore, the connection between a vertical member and a box girder must be rigid and secure.

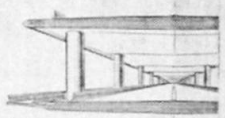
CABLE-STAYED BRIDGE WITH NEW VIERENDEEL TYPE GIRDER

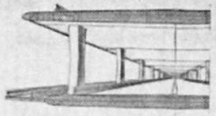




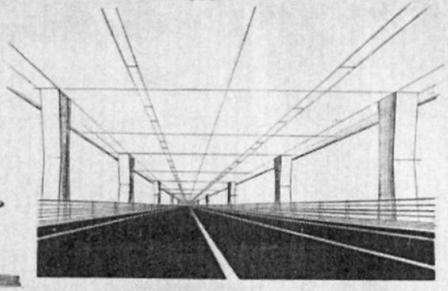
BIRD'S EYE VIEW



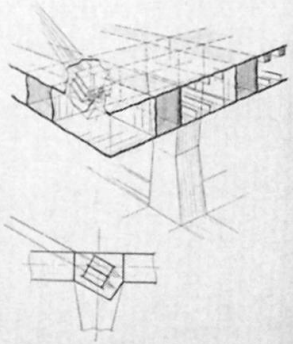


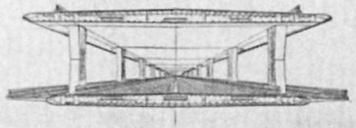


PERISTYLE VIEW

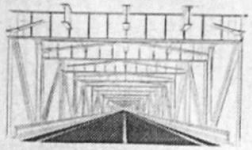


FRONT VIEW



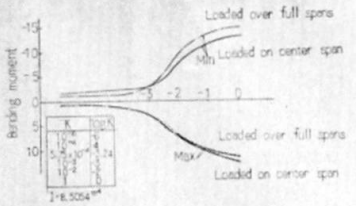


STRUCTURE OF TWO DECKS

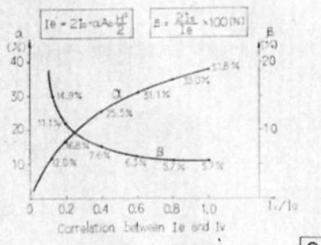


ORDINALY TRUSS-TYPE

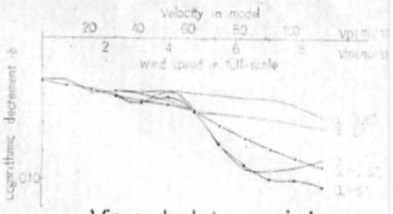
A THE VERTICAL MEMBERS ARE RIGIDLY CONNECTED TO A BOX GIRDER.



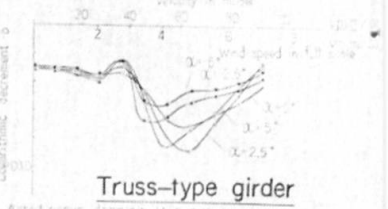
Max.& Min. binding moment versus K parameter



B THE CHARACTERISTICS OF THE FLEXURAL RIGIDITY OF A VIERENDEEL-TYPE GIRDER.



Vierendeel-type girder



Truss-type girder

C AN EXAMPLE OF A TWO-DIMENSIONAL SECTION MODEL TEST IN WIND-TUNNEL.