

Discussion: curved-bridges and skew-bridges

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IIIa

Discussion - Discussion - Diskussion

Curved-Bridges and Skew-Bridges¹⁾

Ponts ocurbes et ponts biais

Gekrümmte Brücken und schiefe Brücken

S. O. ASPLUND

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F. RESINGER: The Fixed-end Restraint Due to Skew Bridge Supports.

The paper treats skew one- and two-span bridges under vertical loads. Geometric and elastic properties permit that the bridge can be replaced by a beam. The ratio of width to length of the bridge is such that the bridge can be calculated as a tube supported on skew parallel lines by special devices. The cross-section of the bridge is assumed to be symmetric in the span and varies "simply" in the "support triangles". Warping is neglected.

Moments in characteristic sections of such bridges are calculated by an elegant and easy method. By substitution of variables, moments in bridges with still simpler stiffness variations can be linearly expressed in certain parameters.

The diagrams obtained in the paper are valid only for such a variation of the cross sections in the support triangles that their bending and twisting stiffnesses can be treated as being constant and equal to two thirds of the bending stiffness and one half of the twisting stiffness of the span, respectively. The limitations and approximations made are probably justified and should mostly give good results, especially if the length of the skew ends is small in comparison with the whole span.

G. HUTTER: Schiefe und gekrümmte Hohlkasten in Theorie und Versuch.

Strains are carefully measured in two cross sections of each observed bridge. Large deviations between calculated and observed strains (50 to 100 per cent) might perhaps be explained by the decrease in the effective plate width for concentrated loads and the local bending of the plate.

W. SCHMID and P. KLEMENT: Die Pillerseeachbrücke der Österreichischen Bundesbahnen.

The authors present a calculation where the effect of torsional deformations is included in the influence lines. The results are in good agreement with observed strains and deflections.

¹⁾ See "Preliminary Publication" — voir «Publication Préliminaire» — siehe «Vorbericht», IIIa 1, p. 607.

W. WIERZBICKI: Pont courbe considéré comme une construction continue à l'axe brisée.

Only centric, vertical loads are treated but no wind, braking, or temperature loads, or excentric vertical loads.

A beam without torsionally fixed supports and subjected to distributed loading does not function as a straight continuous beam but rather as a series of simple beams with considerably larger field moments than in a straight continuous beam.

An important general conclusion is the following: A designer who desires to utilize effectively the continuity of a beam with curved or polygonal axis should fix both ends torsionally and increase as much as feasible the ratio between the torsional and bending stiffnesses of the beam.

M. S. AGGOUR: Space Frame Action and Load Distribution in Skew Bridges.

Four skew bridges with two main girders and two skew bridges with four main girders were investigated. The "space" theory support forces, girder moments and forces in the wind bracing and cross frames were compared with ordinary theory results. It is seen that the action of wind- and cross-bracing unloads the main girders but loads the wind bracing and cross girders. The redistribution is further accentuated when the number of main girders is increased or the bridge is made more skew. That agrees with findings in the design of the Göteborg suspension bridge now in construction where the torsional stiffness of the roadway *doubles* the member forces in the wind diagonals.

All five papers commented on are relevant and useful in the design of skew or curved bridges.

Summary

The five papers about curved-bridges and skew-bridges presented in the "Preliminary Publication" are briefly discussed and proved useful in corresponding bridge design.

Résumé

L'auteur discute brièvement les cinq contributions contenues dans la «Publication Préliminaire» et relatives aux ponts courbes et aux ponts biais. Elles s'avèrent utiles pour l'étude des ponts de ce type.

Zusammenfassung

Die fünf Arbeiten des «Vorberichtes» über gekrümmte Brücken und schiefe Brücken werden kurz besprochen und für den Entwurf dieser Brücken als nützlich angesehen.