Zeitschrift: IABSE reports = Rapports AIPC = IVBH Berichte

Band: 64 (1991)

Artikel: Constructional problems in bridges with box-girders

Autor: D'Agostino, S. / Esposito, T. / Condo, L.

DOI: https://doi.org/10.5169/seals-49298

Nutzungsbedingungen

Die ETH-Bibliothek ist die Anbieterin der digitalisierten Zeitschriften auf E-Periodica. Sie besitzt keine Urheberrechte an den Zeitschriften und ist nicht verantwortlich für deren Inhalte. Die Rechte liegen in der Regel bei den Herausgebern beziehungsweise den externen Rechteinhabern. Das Veröffentlichen von Bildern in Print- und Online-Publikationen sowie auf Social Media-Kanälen oder Webseiten ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. Mehr erfahren

Conditions d'utilisation

L'ETH Library est le fournisseur des revues numérisées. Elle ne détient aucun droit d'auteur sur les revues et n'est pas responsable de leur contenu. En règle générale, les droits sont détenus par les éditeurs ou les détenteurs de droits externes. La reproduction d'images dans des publications imprimées ou en ligne ainsi que sur des canaux de médias sociaux ou des sites web n'est autorisée qu'avec l'accord préalable des détenteurs des droits. En savoir plus

Terms of use

The ETH Library is the provider of the digitised journals. It does not own any copyrights to the journals and is not responsible for their content. The rights usually lie with the publishers or the external rights holders. Publishing images in print and online publications, as well as on social media channels or websites, is only permitted with the prior consent of the rights holders. Find out more

Download PDF: 25.11.2025

ETH-Bibliothek Zürich, E-Periodica, https://www.e-periodica.ch



Constructional Problems in Bridges with Box-Girders

Problèmes constructifs des ponts à poutre-caisson

Konstruktive Probleme bei Kastenträgerbrücken

S. D'AGOSTINO

Professor Univ. of Naples Naples, Italy

T. ESPOSITO

Professor Univ. of Naples Naples, Italy

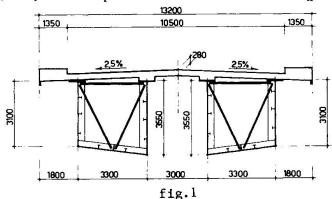
L. CONDO

Dr. Eng. Consult. Engineer Naples, Italy

R. MAURO

Dr. Eng. Consult. Engineer Naples, Italy

The construction of viaducts in a densely populated area of the neapolitan suburbs has given rise to some erection and assembly problems that influenced someway the calculation of the deck structures. These problems have been further emphasized by the cross sectional shape not so usual, as a matter of fact, for composite steel-concrete box girder bridges (fig.1).



adoption of such a kind shape has been motivated by aesthetical factors, the necessity of reducing the visual impact of the bridge in the area. In the sequel it will reported what has been done for the longer spans, whose lenght is equal to 61,10 m. The statical scheme of the bridge is that of a simply supported beam.

The limitated extension of the site and an economic evaluation have led to exclude a sequential erection of individual elements forming the truss, that would have required a greater number of lifting points for the girder and expensive temporary steel truss support. Moreover, the complete assembly of the girders in place and their successive lifting would have required the use of a crane truck of large dimensions, certainaly not compatible with the limited extension of the site and the hardly accessible shape of the area.

Therefore it was decided to completely separate the box girder along the Longitudinal axis and to assembly the two resulting parts, after the erection, by means of a joint placed at the internal side of the bottom flange of the box. In this way the total load to be lifted was reduced to a half (500 KN) and it was possible to use crane trucks having dimensions compatible with the extension of the site.

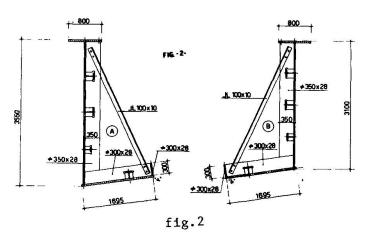
The two parts resulting from the longitudinal cut of the girder were tonsistently asymmetrical and different from each other (fig.2).

This determined not only different vertical deflections but also displacements in the horizontal plane. In order to reduce their values during this temporary stage the end restraints of the beam, placed under two steel transverse diaphragms, have been completely constrained. Operating in this way the



rotation of the terminal cross section were completely eliminated and the statical scheme of fixed ends beam was adopted for calculations. The deflections of the two parts in which the box girder was divided were computed by means of a finite element code. The structure was modelled as follows:

- the longitudinally placed stiffening elements of box and the plates placed at their top have been simulated by means of "beam" elements;
- the diagonal bracings of the transverse diaphragms have been simulated by mean of "truss" elements;
- the webs, the bottom flanges of the boxes and the transversal stiffening ribs have been simulated by means of "shell" elements.

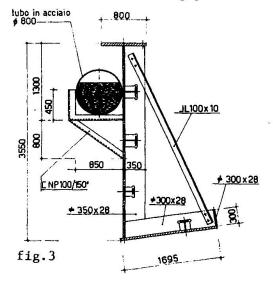


The adopted schematization was motivated by the fact that only dead load acts on the structure. The "sub-horizontal" shape of the box bottom flange due to the different heights of the webs required the use of fictitious "bound" restraints without axial rigidity and very high torsional rigidity. In the midspan section the vertical (v) and horizontal (w) displacements of "a" and "b" turned points out to be.

respectively:

- side A -
$$v = 12,7 \text{ mm}$$
 $w = 13,6 \text{ mm}$
- side B - $v = 15,8 \text{ mm}$ $w = 15,3 \text{ mm}$

In order to achieve the coincidence of the vertical displacements, that turned out to be greater for the part of the box having smaller height (B), a 800 mm - diameter water-pipe was placed as additional load on the outer side of the other part of the box, i.e. that one having greater height (A) (fig.3). The progressive filling-up of the pipe allowed then to obtain on easily controlled vertical displacement up to the exact coincidence with the one of the other part of the box. Fastening the bolts of the longitudinal joint and assembling the horizontal bracing placed in the deek's plane gave to the cross section its



final form and increases the torsional stiffness up to the stiffness of a closed section. It is remarked that the fastening tension in each bolt necessary to eliminate the relative horizontal displacements, was less than 3 KN.