

## The Application of the Finite Strip Method on Curved Box Girder Bridges

**Jonie Tanijaya**  
Professor  
Paulus Christian  
University of Indonesia  
Makassar, Indonesia  
*depeka@indosat.net.id*



**Djwantoro Hardjito**  
Senior Lecturer  
Curtin University of  
Technology Sarawak  
Malaysia  
*djwantoro.h@curtin.edu.my*



---

### Summary

Curved bridges have become a major component of highway systems in recent years. Elevated freeways and multi level interchange are very common in densely populated areas and could hardly be constructed without curved bridges. Usually, these bridges are of cellular cross section so that the high torsional moment due to curvature can be resisted economically.

To date, methods of analysis and design have been very approximate, but because of the large number of curved bridges being constructed everywhere, refined methods of analysis are desirable. In this paper, the main geometric parameters of curved bridges are studied. The finite strip method of analysis applied to folded plate structures as a box girder, for which a general computer program was written. This method of analysis is restricted to structures simply supported along their straight radial edges.

Finally, on the basis of this refined analytical method, the behaviour of curved box girder bridges is studied. In particular, wheel load distribution characteristics are investigated especially with respect to the load position of the bridges.

Keywords: Curved bridges, finite strip method, folded plate, box girder, simply supported.

### 1. Introduction

The choice of materials and geometry of structural elements basically is based on the several structural performance required, such as strength, stiffness and stability. After all the said criteria satisfied, then other considerations such as economic, aesthetics, and other non-technical aspects will be considered.

On the use of thin walled structures, stiffness of the structural elements depends mostly on the geometry of its cross section, for example folded plate. This type of structures was introduced in the 1930s in Germany, and then widely used in other countries in Europe. After the World War II, it was introduced in the United States when Winter and Pei in 1947 formulated the stress distribution for the first time. From that time on, the development of the theory, analysis and application of thin walled structures was getting momentum, especially in the US [6].

Various methods to analyse the folded plate structures have been developed in early 60s [13], whereby a modified version of what-so-called Gaafar method has been recommended, although later on it was found that it was not suitable for computerization. Moreover, the method has limitation for cases with small span-width ratio. Goldberg and Leve in 1957 developed the elasticity method, that was then applied by de Fries-Skene and Scordelis in 1964 [8] as stiffness approach. This method was able to analyse structures with small span, however it was still to complicated for