



## ASSESSMENT OF REINFORCED CONCRETE BRIDGES: UPPER BOUND METHOD OF ANALYSIS

### Chitra Pattabi

Civil Engineer  
WS Atkins India Pvt Ltd  
Bangalore, India  
[chitra.pattabi@atkinsglobal.com](mailto:chitra.pattabi@atkinsglobal.com)

Chitra, born 1978, received her civil engineering degree from the University Visveswaraya college of Engineering. She is working as an Engineer for Atkins India Pvt Ltd. Her experience includes design and assessment of various forms of bridges.



### Rakesh Singh

Civil Engineer  
WS Atkins India Pvt Ltd  
Bangalore, India  
[singh.rakesh@atkinsglobal.com](mailto:singh.rakesh@atkinsglobal.com)

Rakesh, born 1973, received his civil engineering degree from the University College of Engineering, Burla. He is working as a Senior Engineer for Atkins India Pvt Ltd. His experience includes design and assessment of various forms of bridges.



### Summary

The fact that a number of reinforced concrete bridges fail assessment to full design live load and yet do not display any signs of distress, suggests that there are reserves of strength that are not taken into account in the normal assessment process. There are other analytical methods available that can prove that bridge isn't failing.

**Keywords:** Assessment, yield-line, bridge deck, mechanism, COBRAS

## 1. Introduction

Reserves of strength can exist but remain unrecognised if full advantage is not taken of the range of analytical methods available for the assessment of concrete bridges. Therefore any advancement in the understanding of the appropriate techniques to use when modelling the structural behaviour of bridges would alleviate the number of condemned structures and potentially lead to significant savings with the assessment schemes in other regions.

Eight County council bridges previously assessed using linear elastic methods were reassessed using yield-line method. A marked increase in load rating was observed in many cases, with the largest benefit coming from a structure previously deemed to have a load capacity of dead load and superimposed load reassessed to have the full 40T capacity when analysed using the yield-line method. In other cases where only very low percentages of steel reinforcement are present only relatively smaller benefits were derived from employing the yield-line method. The yield-line method was also applied to a structure with longitudinal reinforcement only (i.e. no transverse steel) and the implications of such were investigated. This paper deals with the assessment of eight reinforced bridges using yield-line method.

## 2. Assessment of Bridges

### 2.1 Analytical procedures

The assessment of concrete bridges is typically undertaken by working out the load effects, using an analytical method chosen by the assessing engineer and comparing load effects with capacities, determined in accordance with BD44 and BA44.

Improvements in assessment ratings may be achieved therefore through judicious selection of analytical methods or by recognising unnecessary conservatism in the capacities determined.