

# Study on the Flexural Performance of Continuous Box Girder Strengthened by External Prestressing

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## Abstract

External prestressing is currently a commonly used method for bridge reinforcement, especially for the long span bridge. The flexural performance of continuous box girder after strengthening is crucial for engineering post-evaluation. In this study, the flexural performance of continuous box girder structure strengthened by external prestressing is studied by ABAQUS software. The failure mode, load-deflection curves are analyzed. The load-strain curves of the concrete, steel reinforcements and external prestressed steel strands under load are discussed simultaneously. Extensive parametric studies are carried out to research the effects of various parameters, including external prestressing, diameter of steel strand, and deviation block arrangement. The results show that the ultimate load of the strengthened continuous box girder is significantly increased by nearly 45% compared with the unreinforced structure. Based on the results of parameter analysis, the corresponding optimization design suggestions for external prestressing reinforcement of continuous box girder are put forward. Increasing the value of external prestress and the diameter of external prestressed steel strand can improve the bending resistance of continuous box girder. The performance of continuous box girder strengthened with double folded external prestressed steel strand is the best. This study provides the guidance for the application of continuous box girder strengthened by external prestressing with multi-deviation blocks.

## Keywords

Continuous Box Girder, External Prestressing, Strengthening, Flexural Performance, Finite Element Analysis, Parameter Study