

# Research on Concrete Box Girder Bridge Widening Based on Spatial Grid Model

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## Abstract

In this paper, based on a practical project, the spatial grid model is used to analyze the stress of the widened bridge. By comparing the stress changes, it is concluded that the shrinkage and creep of the new bridge will affect the stress of the whole structure after two bridges are connected. At the same time, the foundation settlement of the new bridge will generate additional stress at the connecting deck of the two bridges. Therefore, when the bridge is widened, certain measures should be taken to reduce the shrinkage and creep of the new bridge and the settlement of the foundation, so as to reduce the influence on the structure and ensure the safety of the widened bridge.

**Keywords:** Bridge widening; Spatial grid model; Shrinkage and creep effect; Foundation settlement

## 1 Introduction

With the increasing traffic flow, many bridges built in the past can no longer meet the traffic needs. In order to make full use of the old bridges and give full play to their economic value, bridges need to be widened to improve its bearing capacity. Reuse of existing bridges can reduce carbon emissions and be environmental friendly.

After the bridge is widened, the connection between the new and the old bridge is connected through the flange slab, and the load is transferred through the bridge deck. Under using load, the bridge will produce torsion and distortion effect. At this time, continuing to use the traditional calculation method will cause errors, and can not accurately calculate the stress state of the structure.

Therefore, in order to obtain more accurate stress state of the bridge, spatial grid model is adopted in this article. Combining a practical project, main

factors that affect the stress of the structure after bridge widening are analyzed, including shrinkage and creep effect, foundation settlement and temperature effect.

## 2 Project overview

This project is a three-span prestressed concrete continuous bridge. Due to the increase of traffic flow, the original bridge needs to be widened to improve its traffic carrying capacity. The span arrangement of the bridge is (28+40+28) m, as shown in Fig.1.

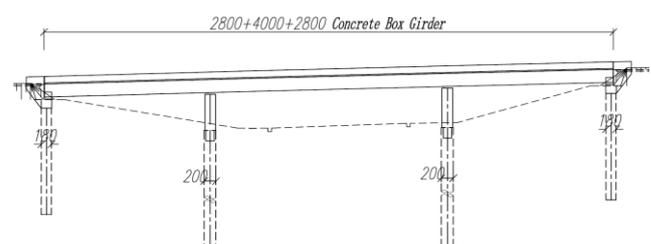


Figure 1. Span arrangement of the bridge (mm)