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Stress Indicators - A Complete Checking System of Stresses for Box Section

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ABSTRACT

The Box section has complicated mechanical behavior under loads, including in-plane and out-of-plane stresses in each slab of box components. Traditional checking stresses originated from simple open sections, such as rectangular, T and I sections, featured by normal stresses at extreme fibers and shear stress in the web. For statically indeterminate box sections, cracks found in the outside surface of the web were much different from those found inside the web. This means that the stress indicator for the outside surface of the web should be different from the stress indicator for the inside surface of the web. These indicators are even different from the indicator at the middle lane of the web, which actually is the traditional shear stress indication in the web. The newly developed stress indicator system includes nine stress indicators in each slab of the box components. Each slab has three layers, i.e., the top, bottom and middle layer. Each layer has three stress directions: longitudinal, transverse and principal. Thus, the nine stress indicators for each slab will consist of all the mechanical behavior, including bending, shear and torsion, under symmetrical and unsymmetrical loads for slabs of the box section. This stress indicator system plays an important role in forensic engineering, especially for deficient bridges.

Keywords: Stress indicator, Box section, Bridge, Bridge deficiency, Forensic engineering.

1 INTRODUCTION

The box section is widely used in the field of concrete bridges, but its mechanical behavior is complex. The spatial effects of a box girder include shear lag effect, thin-walled effect, load

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