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**STRESS CONCENTRATION DUE TO SHEAR LAG IN SIMPLY
SUPPORTED BOX GIRDERS WITH LONGITUDINAL STIFFENERS AND
CONTINUOUS BOX GIRDERS AND FINITE ELEMENT MODELING OF
STEEL-CONCRETE COMPOSITE BRIDGE**

Jaturong Sa-nguanmanasak

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A Thesis Presented

by

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By

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Approved as to style and content by

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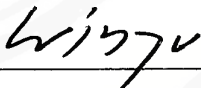
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Abstract

This dissertation covers two separate topics using the finite element method (FEM). In the first part of Section I, the shear lag causing the non-uniform distribution of normal stress over the flange of simply supported box girders with longitudinal stiffeners was studied. In the second part of Section I, the stress concentration due to shear lag in continuous box girders was also investigated. In Section II, a study on the three-dimensional finite element modeling of steel-concrete composite bridge was conducted to simulate the actual bridge behavior. The research synopses of these two topics are summarized below.

In Section I of this research, the present study investigates the shear lag effect in a simply supported box girders with longitudinal stiffeners, and continuous box girders by using the three-dimensional finite element method. The whole girder is modeled by shell elements, and extensive parametric study with respect to the geometry of a box girder is carried out. The influence of finite element mesh on the shear lag is carefully treated by the multimesh extrapolation method. Based on the numerical results thus obtained, empirical formulas are proposed to compute stress concentration factors that include the shear lag effect.

In Section II, three-dimensional finite element analysis of composite steel-concrete bridges is performed to simulate the actual bridge behavior. The solid elements are employed for the concrete deck and the shell elements for steel girders and the cross frames. The accuracy of model is verified against the result acquired from a field test. Thai trucks are loaded at possible locations of the Rama III-Sathu Pradit Bridge in order to obtain the maximum stresses of the bridge. The influences of concrete barriers, Young's modulus of concrete, and the interaction between superstructure and bridge piers are discussed, so as to reveal the actual behavior of the steel-concrete composite bridge. The reactions at the bearings on the bridge piers are also evaluated and discussed in this conjunction. Good agreement is obtained between the models and loading tests to show that the finite element model can aid engineer in design practice.

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