Khemmawit Wannasiri 2010: Behavior of Anchorage Zones in Post-Tensioned PC Girders with Multiple Prestressing Forces and a Support Reaction. Master of Engineering (Civil Engineering), Major Field: Civil Engineering, Department of Civil Engineering. Thesis Advisor: Assistant Professor Songwut Hengprathanee, Ph.D. 179 pages.

This thesis presents finite element analyses for the prediction of the behavior of rectangular anchorage zone in post-tensioned prestressed concrete girder under multiple prestressing forces with a presence of support reaction. The investigation is conducted based on four load configurations consisting of concentric, inclined concentric, eccentric, and inclined eccentric loads. Linear finite element analysis is used to predict the magnitude and the location of bursting force. The influence of several parameters, including anchorage ratio, inclination of the force, eccentricity, magnitude of the reaction force, and the location of the reaction force, is studied. The results are compared to the bursting forces obtained from the equations presented in the AASHTO Standard Specifications (2002) and modified equations presented by Hengprathanee (2004). The results of this study show that the reaction force significantly affects the magnitude and the location of bursting force. In case of concentric load configuration, the magnitude of the force increases when the reaction force increases. However, for inclined load configuration, the magnitude of the force decreases when the reaction force increases. Based on this study, the behavior of bursting force can be classified using the distance between prestressing forces: 1) less than 1.5a, 2) between 1.5a and 0.5h, 3) equal to or larger than 0.5h. The study also proposes a guideline for bursting steel reinforcement consideration under multiple prestressing forces and a support reaction based on Hengprathanee's equations. If the distance between two prestressing forces is less than 1.5a, bursting force comes from the effect of these two forces simultaneously. The calculation can be done using the equations for regular anchorage zone reinforcement with a modification by replacing the width of single anchorage plate with the width of these two adjacent anchors. If the distance of two prestressing forces is larger than 1.5a, bursting force occurs individually right under each anchor. The calculation can be done by applying the symmetrical prism theory. The height of constructed prism presents the width of divided anchorage zone. The finite element analysis results establish the same trend to those using the equations to calculate the magnitude and the location of bursting force for a rectangular anchorage zone presented by Hengprathanee.

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