Formulated Tension Design for Post-tensioned Anchorage Zones and Relevant Equations in Chinese Concrete Bridge Design Code

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Abstract

In post-tensioned concrete bridges, issues of the anchorage zone may occur due to high compressive stresses immediately ahead of the anchorage device and substantial tensile stresses normal to the tendon axis. The versatility of post-tensioned concrete zone still requires more researches to develop systematic and practical design procedures. Based on the compression dispersion model, unified expressions for the bursting stresses and bursting force are formulated. Compared with the bursting force expression in AASHTO highway bridge design specification, the proposed equation is more advantageous by taking the parameters of anchor force eccentricity and inclined angle into consideration. The research results have been adopted as specified equations for computing the tension effects of post-tensioned anchorage zones in the newly updated Chinese concrete bridge design code.

Keywords: concrete bridge design code; post-tensioned anchorage zone; STM; bursting stress; bursting force.

1 Introduction

Post-tensioned anchorage zone is a crucial part to carry large tendon forces and disperse them into bridge structure. Extensive researches into this subject have been conducted for decades by UT at Austin and many other institutes around the world [1][2]. However, because of its complexity, analytical solution for stress distribution is still not available for most cases. A more realistic design procedure is to divide the anchorage zone into two parts – local zone and general zone [3]. Moreover the strut-and-tie models are widely accepted for determining the bursting force generated in general zone, which is recommended in AASHTO Highway Bridge Design Specification [3], Eurocode 2-2 [4], Canadian Highway Bridge Design Code [5], VSL Manuals [6] and PTI [7]as well. However, because of diversity of proportioning and dimensioning details for different anchorage zones, there is great need to update the design approaches.

From the compression dispersion model, unified expressions of bursting stresses and bursting force are derived in this paper, taking anchor force eccentricity and inclined angle into consideration. Based on this research, some equations and provisions on computing the tension effects for PT anchorage zones from the newly updated Chinese concrete bridge design code are expounded.

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