



# Cross Tensioned Concrete Pavement

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## Introduction

Joints are the weakest parts of the Portland Cement Concrete Pavement (PCCP). The deterioration of PCCP often happens due to intrusion of water into the pavement system as well as due to inferior performance of the transverse joints. The infiltration of surface run-off commonly occurs at the transverse joints and cracks.

## Project Objective

In the future, longer lasting pavements with higher load capacities will be needed. One alternative to the conventional concrete pavement is Cross Tensioned Concrete Pavement (CTCP). The objective for this report was to present the fundamental design concepts for CTCP development. As a result of introducing cross pattern post tension stresses in CTCP, there are many unknown stress effects. Typical stresses developed in CTCP were also analyzed.

## Project Description

To investigate the stress at the edge of CTCP, a three-dimensional finite element model was built using ANSYS 5.5 FE software. The software enabled the modification of the geometry of the FE model grid and selection of several element types. These options allowed performing more specific analyses, such as, changes in geometry, boundary conditions, and friction coefficient. SOLID45 element was used to capture behavior of the CTCP and subbase layers in three dimensions. CONTAC174 and TARGE170 elements were used to model the interface friction between the CTCP slab and subbase layers. A literature study was also performed on the experimental test sections on the Superstition Freeway in Mesa, Arizona.

## Project Results

Finite element analysis results show that the maximum tensile stress at the crossing of the strands near the pavement edge is much lower than the recommended allowable stress. The tensile stress between the opposing bearing plates is also reasonable. The proposed design also resulted in maximum compressive stresses and displacements as per design expectation. Thus, the proposed CTCP design appears to be a feasible design solution for longer lasting concrete pavement.

## Report Information

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