

## Strength and Serviceability of Reinforced Concrete Deep Beams

### Description

#### Meta Fields

**Project Completion Year :** 2009

**Project Starting Year :** 2009

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**Primary Sponsor Contact Info :** Texas Department of Transportation Research and Technology  
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**Project Length :** 60

**Budget :** 0.00

**Key Words :**

Bent Caps, Deep Beams, Strut-and-Tie Modeling, Crack Widths, Diagonal Cracking, Serviceability

#### Abstract :

An experimental study was conducted in which 37 reinforced concrete deep beam specimens were tested. The specimens are some of the largest deep beams ever tested in the history of shear research. The data from the experimental program and from a database of 179 deep beam tests in the literature were used to address eight tasks associated with the strength and serviceability design and performance of deep beams. The effects of the following variables were evaluated: distribution of stirrup legs transversely through the web, triaxial confinement via concrete of CCC and CCT nodal faces, quantity of web reinforcement, member depth, and a/d ratio. A new strut-and-tie design method was proposed that is simpler and significantly more accurate than the provisions in AASHTO LRFD (2008) and ACI 318-08, yet just as conservative. Also, it was shown that the discrepancy in shear strength calculated using STM and sectional shear provisions in AASHTO LRFD (2008) at an a/d ratio of 2 is greatly reduced with the use of the proposed STM procedure. A recommendation was made on the amount of minimum web reinforcement needed for strength and serviceability considerations. A simple service-load check was proposed for the purpose of limiting diagonal cracking under service loads. Lastly, a chart was created to aid in the distress evaluation of a diagonally-cracked bent cap in the field.

**Subject :** T-Beams

**Group :** Substructure

**Category :** Completed Projects