



Florida Department of Transportation Research

Prevention of Splitting Failure at Ends of Prestressed Beams during Fabrication

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Vertical cracks sometimes occur near the ends of prestressed, long-span concrete beams. Prestressing is intended to make the beams stronger. However, the cracks weaken the beams and make repairs necessary. In this study, University of Florida researchers worked with beam manufacturers to investigate the types of cracks that develop in the beams, the extent to which they will occur, when and where they will occur, and what causes them.

The beams most affected are those built according to AASHTO, Florida Bulb-T, and Florida U-beam specifications. These beams are made of concrete cast around steel strands, which are embedded the length of the beams. The strands are pulled to create tension while the casting is done. After the concrete has set, the strands are cut so that the tension transfers to the concrete and strengthens it.

The researchers surveyed manufacturers and visited their facilities to observe the beam casting process. They determined that the beams shorten and bend slightly as the strands are cut. This bending movement tends to increase if the strands cool during the cutting process. Friction develops between the casting beds and the beams as they move, which puts additional stress on the concrete and causes cracks.

The researchers confirmed that reducing friction stress under the beam ends could reduce crack formation. They tested and confirmed the effectiveness of techniques for reducing cracking. These techniques included smoothing and lubricating the casting beds,

and embedding steel base plates at the ends of the beams for additional support.



Preventing friction would reduce radial cracking like that shown in the I-beams above.

The researchers also developed a mathematical model to evaluate the sensitivity of beams to friction and other effects that could contribute to cracking. The model is able to provide reasonable, but not precise, predictive results.

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For more information, visit: <http://www.dot.state.fl.us/research-center>.