Resistance of shear tension cracks in prestressed beams

S.J. Kroeze, M.A. Roosen, **C. van der Veen** and M. A.N. Hendriks.

The aim of this study is to investigate how the shear resistance of prestressed beams with respect to the formation of the first shear tension crack can be determined? In the present Eurocode this type of calculations is based on the principal stress which equals the concrete (design) uniaxial tensile strength. Point of departure are the flexural and shear stresses which both are applied to calculate the (simplified) principal stresses. In this analytical method the vertical stress component and the effect of the disturbed areas (near support and applied point load) in the prestressed beams are not taken into account. Furthermore, it appears to be very important whether the prestressed beam, experimentally loaded by a point load, was cracked in bending or not before the first shear tension crack occurs. Therefore, it was decided to analyse 29 prestressed beams, experimentally loaded by a point load, in which shear tension cracks were observed. A linear finite element analysis (plane stress) was performed for all experiments in order to investigate the effect of a) the vertical stress component, b) disturbed areas, c) cracked or uncracked in bending on the principal stress at the instance of the formation of the first shear tension crack. Moreover, different strength criteria's are considered i.e. the uniaxial tensile strength and the bi-axial concrete tensile strength in which the effect of the bi-axial compressive stress on the tensile strength is taken into account. The found results will be presented and conclusions will be drawn if the Eurocode approach is conservative or not and if a more suitable prediction for shear tension is possible.