Compressive membrane action (CMA) in a concrete T-beam bridge deck

In the Netherlands, approximately 150 prestressed concrete T-beam bridges with cast-in-between decks are present. Upon assessment, the strength of these bridges is often too low, partly due to increased traffic loads and partly due to changes in codes, for example in the Eurocode provisions for shear. However, for these types of bridges several mechanism could possibly contribute to a higher load bearing capacity that are usually not taken into account. One of these mechanism is compressive membrane action (CMA), in transverse direction, in the concrete deck slab. In previous research a full 3D model of the complete bridge was used to analyse the local CMA behaviour of the cast-in-between slab. In the current research a local, much smaller, DIANA model of the slab is adopted. The connection of the cast-in-between slab with the prestressed concrete beams is modelled using interface elements. Furthermore, the membrane action can be analysed using composed elements in the concrete deck slab. A direct comparison with the previous research can be made, both in terms of the ultimate load capacity and the CMA behaviour. Ultimately, the goal of this research is to improve the calculation methods for the existing T-beam bridges in the Netherlands.