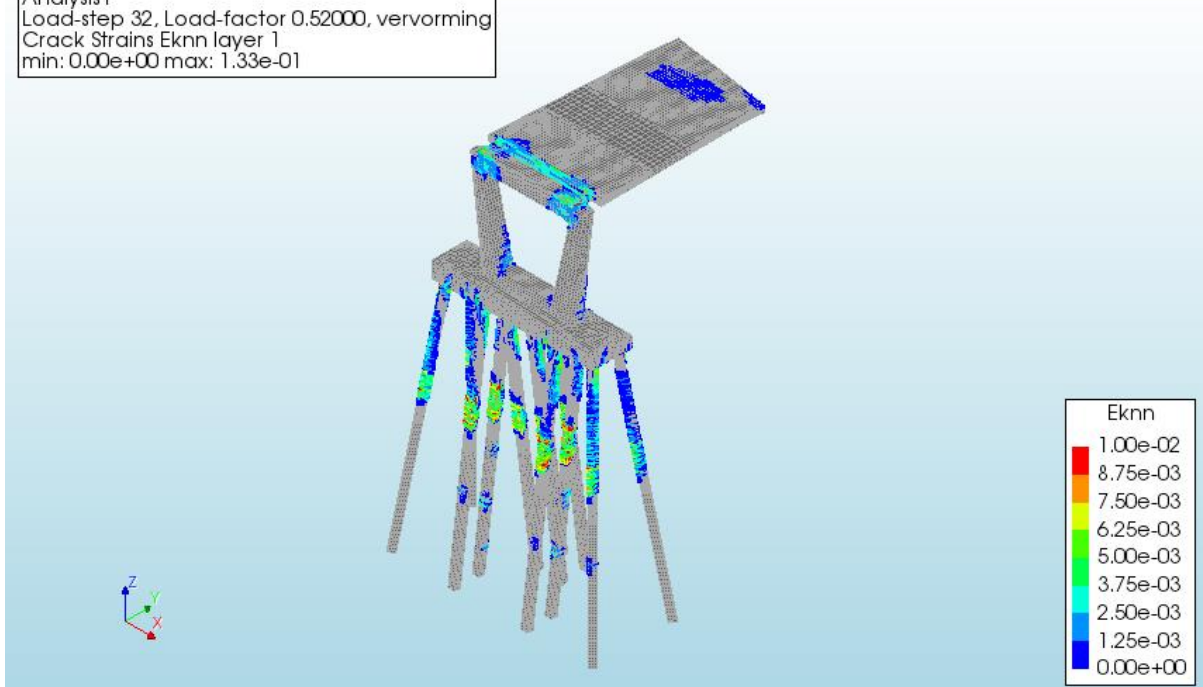


Review on the effectivity of a bridge pier protection system against ship collision Ricky Tai, Arcadis

In this presentation a project from the engineering practice will be discussed. Our client provided us with a third-party design of a bicycle bridge crossing a river with ship traffic. According to local design standards the bridge has to be able to withstand the accidental load of a ship collision. One of the possible scenarios is that a ship will collide into the river bank near the bridge pier. This would lead to tremendous deformations of the pier, which possibly results in the collapse of the bridge due to structural instability. To prevent this, a protection system has been engineered in the design which was provided to us by the client. In the expectance of hidden margins, our client asked us to review the design of the bridge pier protection system, and to evaluate the deformation capacity of the bridge pier against the design standards. In case of an insufficient design, we were asked to provide a solution to guarantee the structural integrity of the bridge.

To achieve this, several analyses have been made with Diana and Plaxis (software for geotechnical analysis). Plaxis has been used to determine the soil behaviour due to the ship collision, while Diana has been used to determine the deformation capacity of the bridge pier. The application of non-linear material models for concrete and reinforcement in Diana made it possible to prove extra deformation capacity for the bridge pier. A special point of attention was to correctly describe the soil-structure interaction caused by the use of two different software packages, hence models, to schematize the situation.

Analysis1
Load-step 32, Load-factor 0.52000, vervorming
Crack Strains Eknn layer 1
min: 0.00e+00 max: 1.33e-01



Typical crack pattern bridge pier due to ship collision.