

Software for manufacturer-independent anchor design and realistic calculation of base plates

The company Dr. Li Anchor Profi GmbH from Freudenstadt has now equipped its software for manufacturer-independent anchor and headed stud design with realistic calculation of structural steel connections to concrete. The program enables users to design anchors and headed studs under static, seismic and fatigue loadings according to EN 1992-4 and ACI 318 and to select them for their respective anchorages. When designing the base plate, the stiffness of the connection profile or stiffeners can be taken into account.

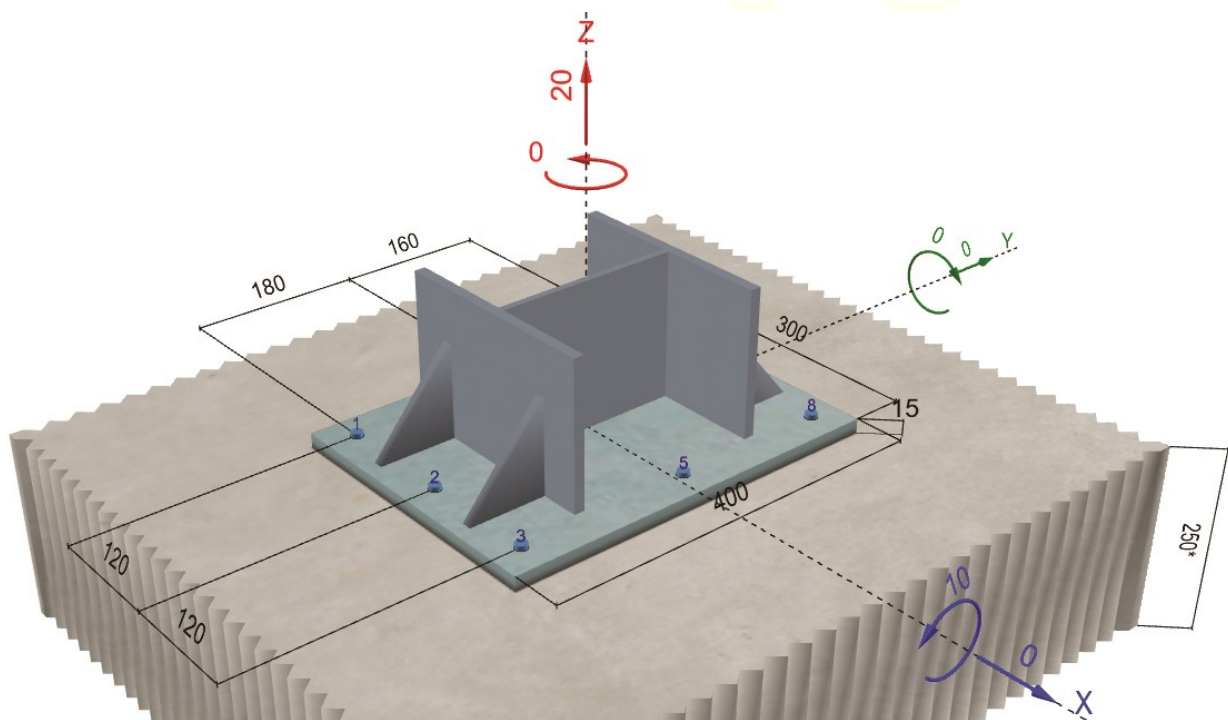


Figure 1 Structural steel connection to concrete with stiffeners

The Dr. Li Anchor Profi GmbH is established on the market with special software for design of anchors and headed studs. Their unique features lie above all in the independence from anchor manufacturers and the ability to design the anchors and headed studs of all common manufacturers in one software. The software offers structural and inspection engineers a neutral tool to carry out and check the design of the anchorages in the concrete independently on the manufacturer's software.

Significantly higher actual tensile stress on the anchors

According to current regulations, such as EN 1992-4, the anchor design is carried out under the assumption of a rigid base plate. In practice, however, it has been shown that the base plate behaves elastically and that the actual tensile stress of the anchors can be significantly higher for conventional base plate thicknesses than that from the calculations based on the assumption of rigid anchor plates. This results in a safety risk in that the calculations can lead to an under-dimensioning of anchors and headed studs. To eliminate this safety risk, Dr. Li Anchor Profi introduced at first a conservative 2D "elastic base plate" model (Stahlbau 2019, Issue 8, page 762-774). The 2D base plate model is now being expanded to a 3D model for realistic modeling of the structural steel connections to concrete. This enables the stress distribution in the base plate and the anchor tensile and concrete compressive forces to be determined taking into account the additional stiffening of the attached profile (Figure 1).

Safe and economical solution

With the simplified 2D model of an "Elastic Base Plate", the design of anchor fastenings with base plates can be carried out efficiently and safely. Due to the neglect of the profile stiffness, the calculated anchor tension forces can but be too conservative under extreme conditions, e.g. with a wide connection profile with stiffeners. The 3D model of the "Elastic Base Plate" offers a safe and economical solution for the design of anchorages with base plates in any application (Figure 2).

Thanks to the computing time optimization, the "elastic base plate" can be calculated in a 3D model for a connection with the usual base plate size with profile and stiffeners with a normal PC in just a few seconds.

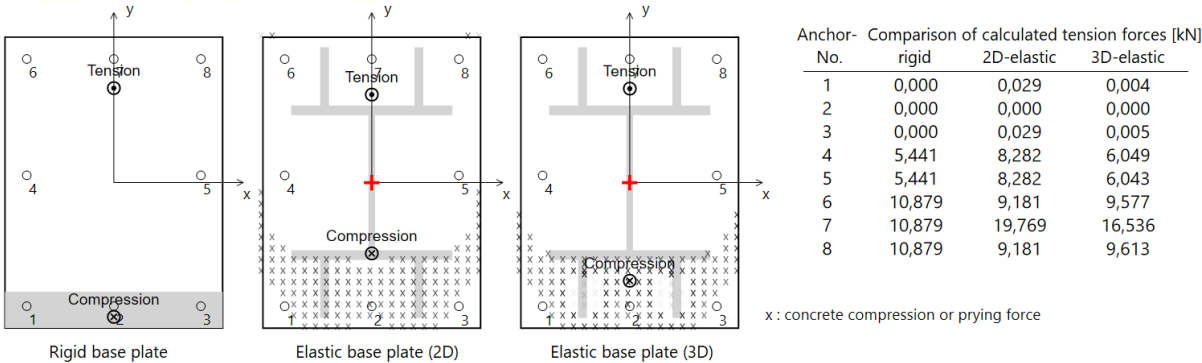


Figure 2 Calculation example for an anchor group according to Figure 1 with bonded anchors M12