

## NOTITIE

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### **Collision protection Oosterweel link tunnels**

For the new infrastructure of the Oosterweel link (Belgium) a sacrificial structure is designed to protect the tunnel. Due to the location at the edge of the port of Antwerp this structure is designed to withstand the impact of a sea vessel. It's energy on impact, about 250 MN, is partly dissipated by plowing through the soil where the remaining energy has to be absorbed by a reinforced concrete bumper. This is achieved by a combination of cofferdam-, beam- and cable action. The energy dissipation through the plowing action is analyzed with Abacus, while the energy absorption of the structure is calculated with DIANA.

The top of the structure is situated about 12 meters below the water table and has a total length of nearly 600 meters consisting of a concrete bumper of 475 meters and an anchor length of 95 meters. The bumper is a cofferdam filled with reinforced concrete, where horizontal sheet piles are used as reinforcement instead of ordinary reinforcement bars. During impact of a ship on the bumper the energy is partly absorbed by the cofferdam action and bending of the bumper in the horizontal plane. However, the largest part of the impact energy is absorbed by cable action in the horizontally placed sheet piles and is achieved by utilizing the plastic strain of the steel.

Recently the anchorage of the cable force in the quay wall is analyzed in detail with the latest version of DIANA X. The existing quay wall is reinforced with railway tracks to properly transfer the cable force from the horizontal sheet piles in order to assure proper anchoring. Special attention is given to model and evaluating the interfaces, stress concentrations and the observed results.