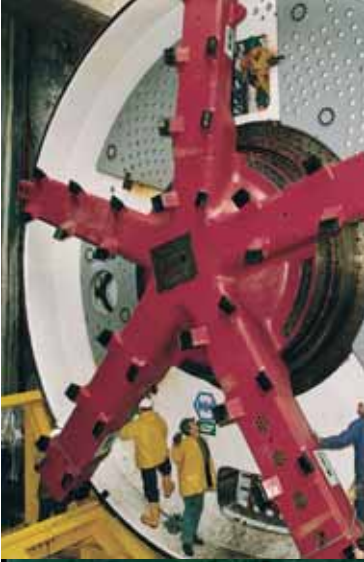


## Second Heinoord Tunnel, Barendrecht

**Client:** Directorate General for Public Works and Water Management, Building Division  
**Design:** Joint Venture TCH  
**Construction:** BAM Civiel bv (as joint venture partner)  
**Contract value:** € 87.488.000  
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# BAM Civiel

The Second Heinoord Tunnel was the first tunnel in the Netherlands to be bored through the country's soft soil. The ground under and around the Oude Maas is made up of 20% clay and peat and 80% sand. This composition required a covering layer equal to the tunnel diameter over the whole length of the tunnel to guarantee stable conditions. To ensure stability, the ground on the very soft south bank was improved and an earth mound was constructed. The tunnel-boring machine used was of the hydroschild type, consisting of a steel cylinder with a five-spoke cutterhead. The cutterhead loosened the soil, which was then mixed with cement and bentonite to stabilise the excavation front and transport the excavated soil. The boring chamber was sealed off by a pressure bulkhead so

that water and soil could not flow into the tunnel. The bentonite/soil mixture was removed through the tunnel to a separation plant, where the bentonite was recovered for reuse. Each time the boring machine had moved forward 150 cm, the next tunnel ring of eight precast concrete sections was put into position using an erector and hydraulic jacks. The space outside the tunnel walls was then filled with grout. The jacks that moved the boring machine forward then pushed against these new concrete sections. Correct direction and positioning were determined using a theodolite and laser system. Behind the shield were the wagons carrying various types of equipment including pumps, cable drums, hydraulic units, grout injection systems, control equipment, transformers and the control room.