

# North - South Line CS Tunnel Netherlands

Transport and immersion of 1 tunnel element

## Project information

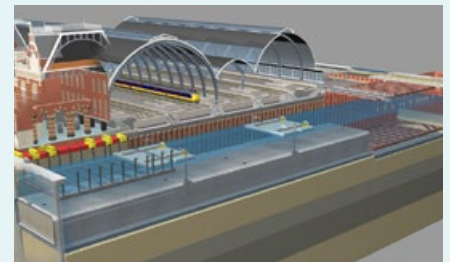
Client:	City of Amsterdam, Dienst Infrastructuur Verkeer en Vervoer in Amsterdam
Duration:	5 years
Date of completion:	July 2011
Contract value (EUR):	€ 2.160.000,00

## Description of the activities

Design, engineering, preparation and execution of the transport and immersion process of the tunnel element underneath the monumental buildings and railway platforms of the Central Station in Amsterdam, which is part of the project North - South Line.

## Details

Type:	Subway tunnel
Length immersed section:	136 meters
Total amount of elements:	1
Element measurements:	TE01 (LxBxH) = 136 x 21,08 x 8,05m
Depth:	16,8 meters
Achieved placing tolerances:	Vertical: +/- 10 mm, horizontal: +/- 25 mm
Foundation:	Sandflow



## Specific information

For the part of the North - South Line underneath Amsterdam Central Station and under the adjacent river IJ the immersed tunnel technique has been used. Both tunnels were built inside a casting basin in the northern approach ramp of the IJ-tunnel. The tunnel elements were floated while flooding the casting basin and transported through the river IJ and the North Sea Channel, to a temporary mooring location in the Suezhaven at a distance of seven nautical miles. During transport the shipping lane could not be blocked, shipping was regulated.

Because of the limited space underneath the monumental buildings and railway platforms of Amsterdam Central Station and the relatively high water level in the river IJ, the CS-element was brought in position in several stages. A temporary cofferdam and two partitioning walls were used to create a sluice to be able to lower

the water level in two steps to a total of 2.6m enabling to move the tunnel elements underneath the platforms and station building.

The immersion system for the tunnel element consisted of coupled container pontoons equipped with a winching system.

The pontoons were assembled underneath the roof slab on top of the floating tunnel element. Because of the limited operational space (less than 3 meters) the immersion weight was optimized to minimize the height of pontoons and winches. For the same reason a tailor made survey system was developed using a folding survey tower.

Due to underwater struts beneath the station building the tunnel element had to be immersed for 4 meters and transported in longitudinal direction over 49 meters underneath the struts,

while immersed, to reach its final horizontal position. Accurate guiding systems inside the trench protected the foundation of the station building from damage. After further immersion, under water lifting bags positioned the tunnel element in transversal direction and 4 deck mounted steel suspension beams were lifted and coupled to the floor of the railway platforms to secure the vertical position. An integrated jacking system adjusted the tunnel element in vertical direction. Finally the remaining space under the tunnel element was filled by sand flowing.

