

# THE NORTH SEA TERMINAL

Ir. F. Aerts

## DESIGN

A quay wall on a diaphragm wall in reinforced concrete of 1.5 m thick, passively anchored at two levels to an anchor wall in sheetpiling. The diaphragm wall is a cast-in-place concrete wall which is built in sections by the slurry trench method. A special grab excavator first digs a trench between guide walls. The trench is filled continuously with supporting slurry.

## PRELIMINARY WORKS

Taking into account the construction type, the building of the slurry walls, and the placing of the anchors at level -6.50 TAW, the major part of the construction had to be done on land. This made it necessary for the contractor to build a temporary protective construction in the river.

The protective construction consists of a cofferdam. Both walls of the cofferdam consist of LARSSEN IV-N sheet piles which are linked every 0.80 m by diam. 40 mm GEWI tension bars.

The temporary protection and the building platform behind it were built in stages. The first section covered 500 m from the upstream part to the beginning of the cofferdam. After the construction of the earth dike and the cross dike the building platform was excavated at level + 3.00 TAW.

The second stage of the cofferdam was completed on the river. After driving the sheet piles and the

combi-walls respectively, the gap between the cofferdam was filled hydraulically and subsequently compacted. In the next stage the land between the cofferdam and the old Scheldt dike was hydraulically filled up to level + 3.00 TAW. To keep the building excavation dry, extensive dewatering was installed.

## CONSTRUCTION OF THE FRONT WALL

The front wall is divided into three parts :  
– the upstream quay wall, built as a combi-wall,



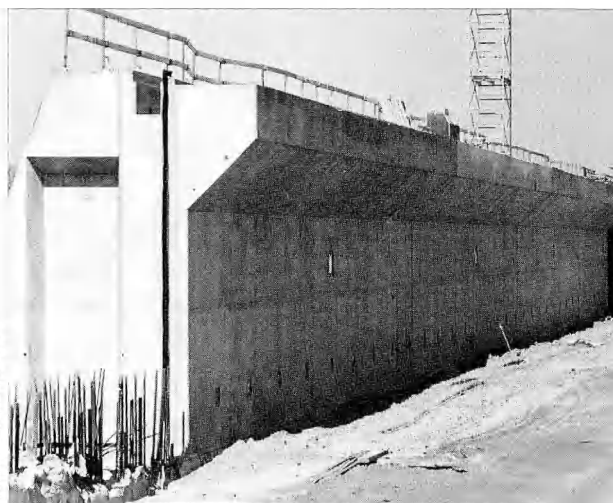
Foto Guido Coolens N.V.



- the mid section, a slurry wall,
- the downstream quay wall, another combi-wall.

The total length of the slurry wall is 900 m. The wall is 1.50 m thick and consists of panels being 7.20 m long. The panels were excavated under bentonite protection.

The excavation was performed by means of a hydraulic LEFFER grab. Reinforcement per panel is achieved by two baskets each composed of three overlapping parts. In the top basket HDPE tubes are already fitted through which the anchor strands will be passed at a later stage. To ensure the tightness of the slurry wall a dovetailed joint is used between the panel.



The downstream quay wall was built like a combi-wall. The tubular piles have the following dimensions: section 1,820 mm, gauge 20 mm, length 34 m and a weight of over 30 tons each. The gap between the tubular piles was bridged with 80 mm wide twin sheet piling of the LARSEN IV-N type. The pile driving was done from pontoons on the river.

The upstream quay wall, to which a Ro-Ro pier is to be mounted, was also built as a combi-wall. The wall was composed of tubular piles with a 1,720 mm section, a gauge of 19 mm and a length of 30 m.

### ANCHOR WALL

The anchor wall consists of free-standing tubular piles with a 1,220 mm section, 12.5 mm gauge and length 28.5 m. The distance axis to axis between the tubular piles is 2.40 m. The anchor wall also serves as a foundation for the land inward gantry crane track.

The entire front wall was connected at two different levels to the rear anchor wall by means of partly pre-tensioned steel strands. These Dywiddag anchors are attached to the front wall at levels -6.50 and + 3.50.

At these levels trumpet-shaped pockets have been provided in the concrete of the front wall and the anchoring piles to allow the strands to cope with soil settlements up to 12 cm without secondary stresses being induced in the anchors. These anchors were made of 15 strands which have been partly pre-tensioned up to 750 kN.

### CONCRETE CAP

The superstructure of the quay wall, both on the slurry wall and combi-wall consists of a concrete cap. The thickness is 4 m and the length of each section was 21.60 m, which corresponds with three slurry wall panels.