Boskalis
Dredging & Marine Experts

PROJECT SHEET

PORT OF CHERBOURG, FRANCE
LENGTHENING OF THE QUAI DES FLAMANDS

INTRODUCTION

In anticipation of offshore wind farm developments in France, the Port Authorities of Cherbourg and Caen-Ouistreham have decided to expand their ports to accommodate this industry.

PROJECT SPECIFICATIONS

To accommodate an assembly plant for wind turbines, a 220 m quay wall had to be added to the existing quay and two hectares of land behind the new quay had to be reclaimed. A specific contract requirement for the quay wall and terminal was the bearing capacity of 15 t/m^2 and the maximum allowed settlement of 3 cm under a load of 15 T/m^2. Two berth pockets were constructed at the same time: one with a water depth of 14 m and the other with a depth of 10 m. A turning circle in front of the new quay was dredged to a depth of -12 m.

In the joint venture, Soletanche-Bachy was responsible for all the civil-engineering work and Atlantique Dragage was in charge of the marine work.

The execution of the project was divided in four stages:

1. Dredging of turning circle and both berth pockets. The dredged materials were designated for the construction of a temporary bund, needed to build the diaphragm walls (quay wall and anchor wall)
2. Construction of the quay wall
3. Removal of the temporary bund on the outside of the new quay wall. The dredged materials to be used for the reclamation of a new terminal behind the constructed quay
4. Testing and hand-over of the work

FEATURES

Client	Port Normands Associés (PNA)
Location	Cherbourg, France
Period	November 2012 – February 2015
Contractor	Soletanchy-Bachy / Atlantique Dragage Joint Venture

A Schist blasting
B General view of the Quai des Flamands

STAGE 1: DREDGING AND CONSTRUCTION OF THE TEMPORARY BUND

As the geology of the area indicated the presence of hard soil (schist) underneath a thin layer of sediment within the dredging profile, our sister company Boskalis Terramare was asked to intervene with one of their drilling and blasting barges and to blast some 113,000 m^3 of schist.
A large backhoe dredger executed the dredging work. The dredged materials were transported and deposited by small split hopper barges at the future location of the temporary bund.

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As on-site testing by Soletanche-Bachy showed that a bund made entirely from schist would not able to contain a bentonite mixture, changes were required to the design of the temporary bund. A core of sand was added at the location of each diaphragm wall.

Until the mean low tide level was reached, all the marine work was executed with marine equipment. Once the temporary bund was above that level, dry equipment was needed. The barges deposited the dredged material within the reach of land-based excavatorsthat then handled the material. Dumpers and a bulldozer were used to raise the bund to the final level of +7.80 m. A total of 248,000 m³ of overdredged soil was needed to create the temporary bund.


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STAGE 2:
CONSTRUCTION OF THE QUAY WALL
The quay wall structure was based on a diaphragm wall concept. Soletanche-Bachy excavated a trench in each sand core down to the schistlayer below. Frameworks of reinforcement bars were lowered into each trench and concrete was poured.

STAGE 3:
REMOVAL OF TEMPORARY BUND AND RECLAMATION OF NEW TERMINAL
Once the quay wall structure was in place, the temporary bund on the outside of this wall had to be removed. A long-reach land-based excavator and a large backhoe dredger were used to bring the material onshore. A second excavator,with assistance from two dump trucks and a bulldozer, was used to transfer the dredged materials into the reclamation area.The level of the water remaining in the pit behind the diaphragm wall was lowered as far as possible with a pump so the area could be filled with dry material since schist is difficult to handle and compact in a wet environment. The reclamation area was filled in layers of 50 to 60 cm, making it possible to compact the filled materials using a vibro-compactor. Plate load tests were performed on the compacted soil regularly in order to check that the work was progressing in line with the contractual criteria.

STAGE 4:
TESTING AND HAND-OVER
Once the reclamation area had been completed, a testing program was established to demonstrate the compliance of the new area with the contractual criterion of a maximum of 3 cm of differential settlement measured over a distance of 6 m under a load of 15T/m². On-site tests were conducted, simulating a load of 15 T/m² at seven test locations. The results of these tests showed an average settlement of 18.9 mm after 24 hours of measuring.

EQUIPMENT
The following equipment was deployed on the project:
- Backhoe dredger Manu Pekka
- Split hopper barges Erik, Frederik and HH210
- Drilling platform Rockbuster
- Auxiliary vessels Halli, Llanddwyn Island, AfonLligwy and North Stack
- Dry earthmoving equipment: 4 excavators, 4 dumpers, 2 bulldozers and 1 vibro-compactor

C Temporary bund completed and ready for diaphragm wall construction
D Construction of temporary bund
E On-site testing of the bearing capacity of the reclamation area
F Removal of temporary bund

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