

PROJECT SHEET

SWINOUJSCIE, POLAND

CONSTRUCTION OF PROTECTIVE BREAKWATER AND ACCESS CHANNEL FOR SWINOUJSCIE EXTERNAL PORT

INTRODUCTION

The protective breakwater for Swinoujscie External Port comprises a 3km long breakwater and groyne for a new outer harbor construction to facilitate a LNG tanker berth and other related activities in the Baltic Sea. The construction of the breakwater took 2 ½ years and was completed in December 2012. Boskalis International B.V. was the leader of a consortium consisting of Boskalis International B.V., Hochtief, Aarsleff and Doraco. The project consists of the following distinctive elements:

- Dredging of access channel and turning basin
- Ordnance removal
- Rock works for breakwater and groyne construction
- Civil works for breakwater and groyne construction.

PROJECT SPECIFICATION

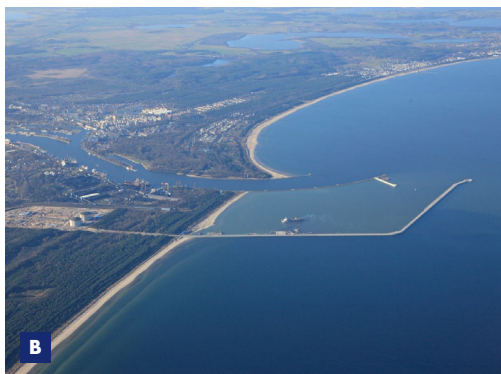
Rock works

The breakwater design is based on a core using "wide grade" material 1-200mm, a light armor layer with a single layer of Xblocs.

- Core material: 900,000 tons.
- Underlayers and light armor (up to 5t): 1,150,000 t.
- Xblocs: In total 11,000 of 1m³ Xblocs; 16,200 of 2.5m³ Xblocs and 2,050 of 5m³ Xblocs were positioned.
- The construction of the western groyne involved the fabrication and installation of 3,000 Tetrapods.

Rock transport

Overseas rock transport was carried out by Boskalis tugs and barges, supplemented by self-offloading coasters and bulk carriers. The rock originated from various quarries in Sweden and Norway. Self-unloading bulk carriers delivered 400,000t of a total of 2 million tons of rock to the site and placed it directly in the structure (using their conveyor belt).



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FEATURES

Client	Urząd Morski w Szczecinie/Maritime Office in Szczecin
Location	Swinoujscie, Poland
Period	2010 - 2013
Contractor	Consortium of Boskalis International B.V. / Hochtief / Aarsleff / Doraco



A Location map

B Aerial view November 2012

C Aerial view November 2012

Civil works

The first 2km of the breakwater consist of a piled combi wall on the inside, and a rubble mound on the seaside with a concrete superstructure. For the combi wall construction, 13,600t of steel piles were used, as well as 2,500t of steel sheet piles and 2,900t of steel anchor beams. On the outer part of the breakwater (2km - 3km) the concrete superstructure is located on top of the rubble mound. For the concrete capping and parapet wall 6,150 t of reinforcement steel and 80,200m³ of concrete were used.



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Geofabric placement

The soil conditions at the roundhead area required the use of a geofabric. A custom built pontoon was deployed to place this 'heavy geofabric'.

Rock placement, forming and shaping armoring layers

The main structure was built and shaped by excavators operating on the core structure or from spud pontoons. The excavators were equipped with a crane monitoring system (CMS) developed in house and based on DGPS, allowing for the rapid and precise shaping of the rock layers above and below the water level.

Xblocs

Xblocs measuring 1, 2.5 and 5m³ were positioned on the main breakwater. The Xblocs were produced in the port of Swinoujscie.

The Xblocs were transported to the breakwater, mainly by barge, and then positioned by hydraulic excavators equipped with CMS and DGPS. For the underwater placement of the Xblocs, a 3D real-time sonar was added to the excavator configuration.

PROJECT CHARACTERISTICS

Dredging works

An access channel and turning basin were dredged to a depth of -14.50m. Dredging started in August 2011 and was completed by January 2013, with a total volume of 8.2 million m³ sand being removed by the Trailer Suction Hopper Dredgers (TSHD) Crestway, Shoreway, Shoalway and Barent Zanen.

Ordnance clearance

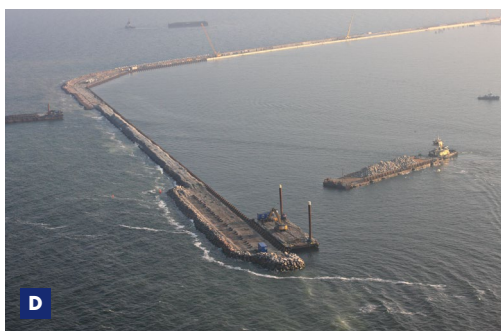
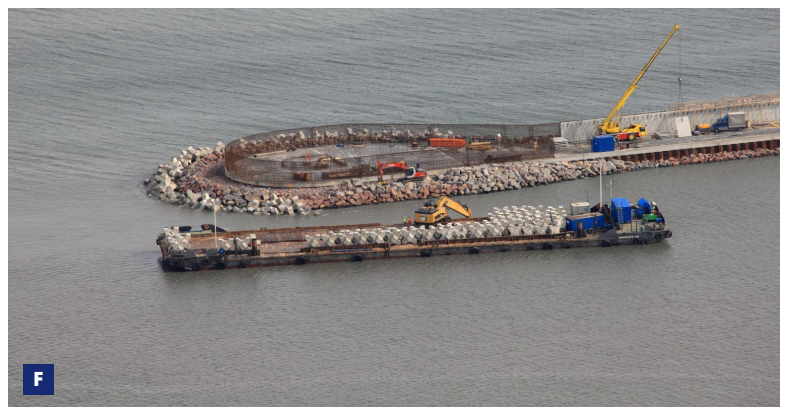
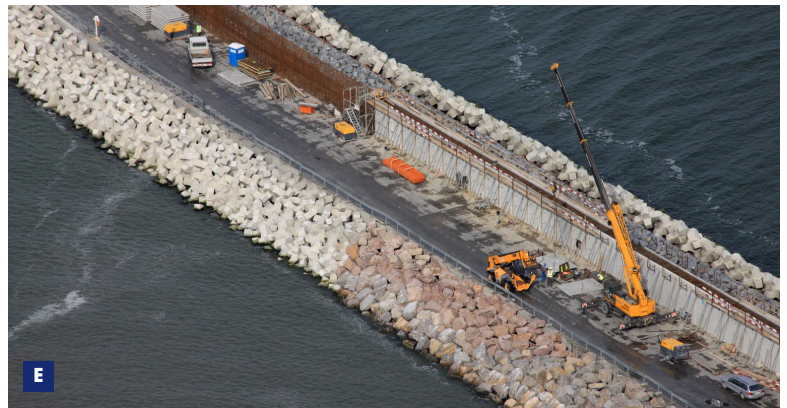
The project was located in part near an old ammunition dump area and required the expertise of Boskalis Hirdes. Using specialized equipment (a magnetometer) and software, more than 15,000 magnetic points were located; 25% were declared to be potentially dangerous. All potentially dangerous objects were removed by divers and approximately one third of these objects were found to be unexploded ordnance. A total area of 136ha was cleared.

Breakwater construction and civil works

The project had to be completed within a tight time schedule while working in an unprotected environment. The location in the Baltic Sea involved managing icy and adverse weather conditions. Throughout the project, interface management between the civil and rock group was vital in executing the work together on a narrow strip in the sea, always keeping an access road open for formwork, concrete supply, rock and Xbloc transports.

The rock and civil activities:

- A total of 11,000 of 1m³ Xblocs; 16,200 of 2.5m³ Xblocs and 2,050 of 5m³ Xblocs were positioned.
- The civil group installed a combi wall for the first 2km, after which the rock group provided a platform in the form of a rubble mound for the civil group to work from.
- After the construction of a concrete superstructure including a parapet wall the civil group handed the area over to the rock group.
- The rock group completed the breakwater outer armor layer consisting mainly of Xblocs.
- The final stage of construction consisted of road paving and electrical works on the breakwater by the civil group.



- D** Aerial view February 2012 showing spud pontoon and rock barge
- E** Aerial view showing parapet wall under construction, Xbloc and armor rock construction
- F** Roundhead under construction, civil works, rock profiling, Xbloc placement

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