

STEEL SHEET PILES FOR A NEW BREAKWATER AND LNG TERMINAL, PORT OF SWINOUJSCIE, POLAND

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Abstract: *Steel sheet piles have been used worldwide for over 100 years to build port structures. Quay wall tend to go deeper in order to accommodate larger vessels, especially the latest post-Panamax container ships. One of the largest Container Terminal that is still under construction is the JadeWeserPort in Wilhelmshaven, Germany, with a berthing length of 1700 m that can accommodate four vessels simultaneously. Over 40.000 tonnes of steel sheet piles, including the new HZM/AZ combined wall system, have been supplied for this quay wall with a design level of the seabed at -23.0 m. On the other hand, LNG terminals are predominantly built offshore, mainly because of the required draught of the LNG vessels. However, this new LNG terminal in Poland innovates in the construction method of the terminal and the breakwater.*

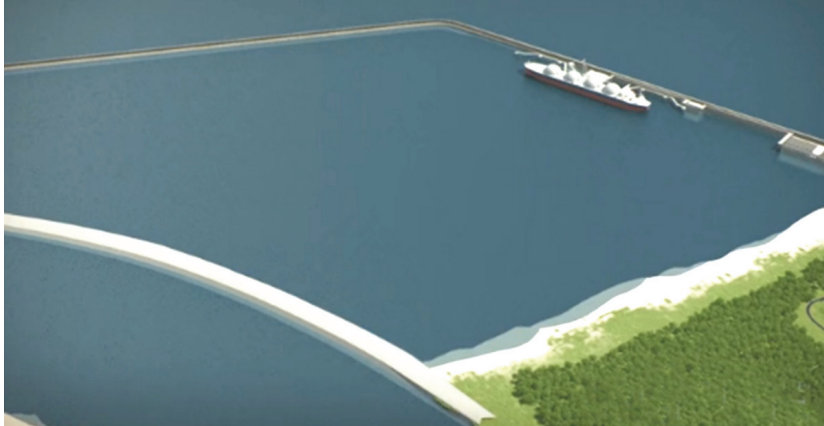
Keywords: *Steel sheet piles, harbour construction, innovative foundation solution for a breakwater, LNG Terminal*

Introduction

The port of Swinoujscie in Poland is situated directly on the sea. It is among the largest seaports in the Baltic Sea region, connecting Scandinavia with central and southern Europe. It is also located close to Berlin (140 km), and another relevant asset is the access to the European inland navigation system through the Oder-Havel Canal. The Port authority is investing into new quays and is modernising the existing port infrastructure, as well as improving roads and rebuilding rail infrastructure. The main target is to adapt the infrastructure to the requirements of modern transportation systems to increase its competitiveness compared to nearby seaports.

Concept of the new port structure

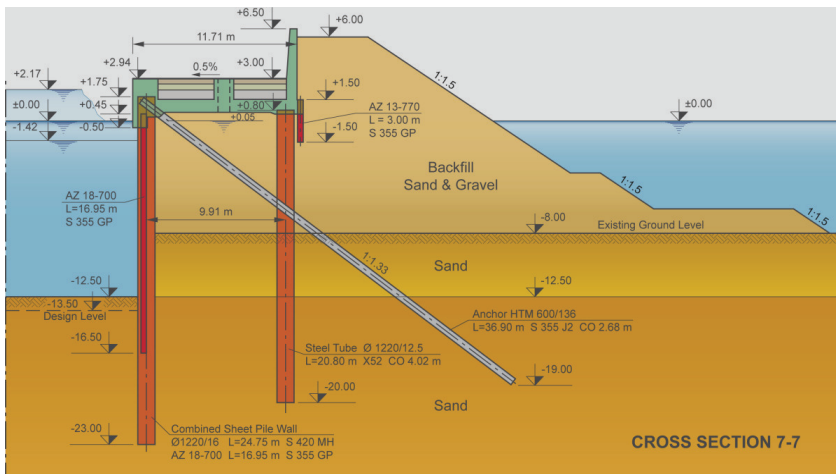
The project of the external port is connected with the government policy of diversification of deliveries of energy-related raw materials to Poland. It includes the construction of LNG (Liquid Natural Gas) terminals, and facilities of the port for ships with a draught of 13.5 m and length up to 300 m. The LNG terminal, a facility to off-take and re-gasify liquefied natural gas, is designed as an external port situated next to the new larger and longer eastern breakwater that will be built from the northeast. South from the external port situated will be warehouses and dispatch section of the terminal. The terminal will receive vessels of about 70,000 DWT (dead weight tonnes). Additionally, the new breakwater will turn the external port into a shelter for any vessel at sea near the port.



The breakwater and the quay wall are being built with a combined wall system supplied by ArcelorMittal directly from the mills in Luxembourg and in The Netherlands. One of the main advantages of the steel foundation solution compared to other alternatives is the speed of construction and the quality of the product itself. Sheet piles are a prefabricated product with guaranteed characteristics. They are supplied on a Just-in-Time basis, with the required length. Hence, they arrive at the job-site ready to be driven into the ground without any additional delays.

New breakwater

The breakwater is around 3 km long. The cross-section shows the quite innovative approach of the design of a civil engineering structure with a dual function: a standard breakwater (on the sea side) and a quay wall for berthing ships acting as a shelter (on the port side), combined in a single structure.



In less than five months, 13.600 tonnes of steel pipes up to 24.6 m long, and 3.250 tonnes of sheet piles were delivered to the main contractor Hochtief Construction AG, in joint venture with Per Aarslef, Boskalis and Doraco. The installation works are done from five jack-up platforms with hydraulic hammers.



The loading quay

The loading quay wall itself is being built by a joint venture Möbius, Bunte and Pihl, using an HZM/AZ combiwall system with HZM piles up to 26.8 m, and a pipe/AZ combiwall system. The design considered a classical retaining wall with one anchor level. The different steel components are installed from a jack-up platform with an hydraulic hammer IHC S70 mounted on a leader fixed on a Hitachi 150 crane.



Furthermore, a large technical platform was built on the shoreline, using standard AZ sheet piles. The layout of this platform is quite complex and required a lot of special fabricated sheet piles for the corners.

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| Project owner: Port of Swinoujscie |
| LNG Terminal Operator: Polskie LNG S.A., Swinoujscie |
| Breakwater: |
| Contractor : JV Hochtief Construction AG, Per Aarslef, Boskalis, Doraco |
| Pipes: 13.600 t of Ø 1220 mm / 12.5 - 16 mm, steel grades: API X52, X56, X60, X65 & S 420 MH, lengths: 15.2 – 28.7 m |
| Sheet piles: 3.250 t Infill sheets: AZ 18-700, steel grade S 355 GP, lengths: 17.0 – 20.0 m Anchor wall: AZ 13-770, steel grade: S 355 GP, length: 3.0 m |
| Anchor piles: H bearing piles up to 38 m |
| Loading quay wall: |
| Contractor: JV Hochtief Möbius, Bunte, Pihl |
| HZM/AZ: 1.100 t HZ 880MB-12, HZ 1080MA-12, HZ 1080MB-12 Steel grade: S 355 GP, lengths : 21.7 – 26.8 m Infill sheets: AZ14-770-10/10, steel grade: S 355 GP, lengths : 17.5 – 21.0 m |
| Pipes: 3.360 t of Ø 508 / 12.5 to 1870 / 25 mm, steel grade: S 355 J0H, lengths: 19.4 – 32.0 m |
| Technical platform |
| 1.380 t of AZ 18-700, AZ 26-700, AZ 28-700, AZ 37-700, AZ 39-700 Steel grade: S 355 GP, lengths : 20.0 – 23.9 m |
| Total: 22.690 t of steel sheet piles / steel pipes |



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