

newsletter

09.03.2009

“Successful load bearing test of AZ-700 steel sheet piles in Poland”

The predictability of the **bearing capacity of steel sheet piles** contributes to its increasing use as foundation solutions for bridge abutments. In order to save additional works, and therewith costs, this method combines the call for small settlements of bridge abutments and the advantage of fast execution of the abutment structure. In addition, it helps minimizing costs by reducing required workspace, and acts as temporary retaining wall too.

In **Warsaw, Poland**, a new 10.4 km long Expressway “Droga ekspresowa S8 Trasy Armii Krajowej” is being built to connect Konotopa and Prymasa Tysiąclecia junctions. The project is funded by the National Roads and Motorways Administration GDDKiA (Generalna Dyreksja Dróg Krajowych i Autostrad) and is being executed by a consortium of four companies (Budimex Dromex S.A, Strabag sp. z o.o., Mostostal Warszawa S.A., Warbud S.A.). The pile driving company is AARSLEFF sp. z o.o..

The most impressive object on the S8 expressway jobsite is a **450 meters long road intersection** which includes an underpass utilizing ArcelorMittal’s steel sheet piles between km 0+154 and km 0+600.

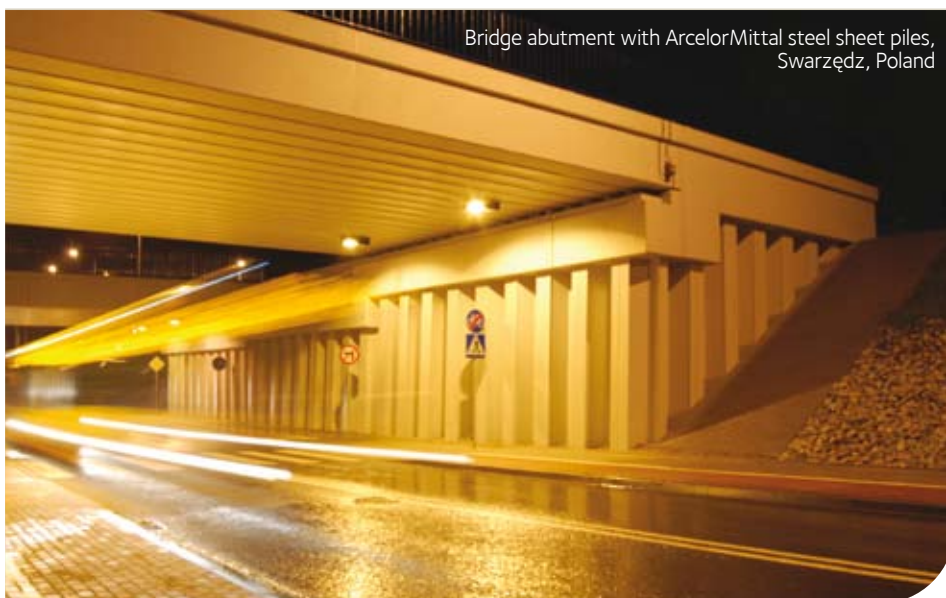
More than **2 600 t of steel sheet piles** from Belval’s AZ range were chosen as load bearing foundation elements for the abutment of the long span bridge WD16 of intersection L1. Two rows of sheet piles on both sides of

the road are working together as temporary retaining walls during the construction period and will remain as permanent structural elements for both retaining the backward soil masses and bearing the heavy vertical loads from the bridge.

The original solution with older AZ 34 sections has been switched to the newer and more cost-effective **AZ 37-700** piles. Achieving the same load bearing capacity with such wider piles had to be demonstrated. An axial load bearing test was imposed in order to confirm the load bearing capacity and vertical settlement of the future abutment.

To simulate the same performance under similar soil conditions (medium dense sands) as the final wall, and to avoid influences of shear forces in the interlocks on final results, the tested double pile had the same length as the final piles (15 meters). The pair was driven separately with the same equipment, a high frequency vibratory hammer, in between the two parallel permanent walls.

The test setup was assembled and carried out by the pile driving contractor, with the assistance of two foundation engineers from ArcelorMittal (**Commercial RPS Poland and Luxembourg**), and under supervision



Bridge abutment with ArcelorMittal steel sheet piles, Swarzędz, Poland

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Construction phase of the underpass



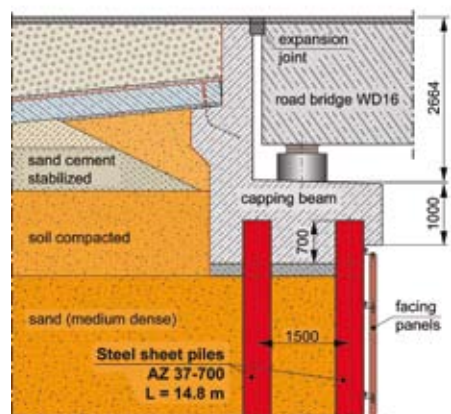
Static load test set-up

of the consultant, Dr. Ing. Jaroslaw Rybak from the Technical University of Wroclaw. Four independent displacement gauges were installed to measure the deflection in every single load step. The pressure-induced load was increased stepwise to the maximum value. **The ultimate load was reached at 1800 kN which is much more than required by the design of the bridge abutment, and corresponds to the weight of three fully loaded Boeing 737.** Settlements were well within allowable limits.

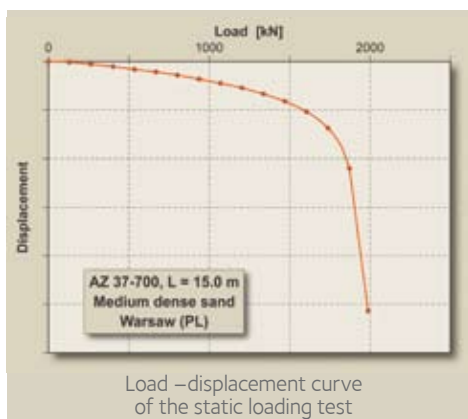
During the last years many road work structures have been carried out all over Poland, including many bridge abutments utilizing steel sheet piles. Based on upcoming stimulus packages we see a further huge potential for ArcelorMittal foundation solutions in Poland and other new Eastern European countries.

A very impressive structure completed in 2007 shows the railway bridge in the city of **Swarzędz** where more than 300 t of AZ 50 in high strength steel grade S 430 GP have been used as **permanent bridge foundation**.

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Cross section of the bridge abutment



Load –displacement curve of the static loading test



Steel sheet pile bridge abutment