Zeitschrift: IABSE structures = Constructions AIPC = IVBH Bauwerke
Band: 11 (1987)
Heft: C-43: Excavations

Artikel: Deep excavation for gravity separator at steel mill (Sweden)
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DOI: https://doi.org/10.5169/seals-20387

1. Deep Excavation for Gravity Separator at Steel Mill (Sweden)

Client: *Swedish Steel Corporation, SSAB*
Consultants: *Viak AB, Stockholm*
Contractors: *Siab*
Grout contractors: *Sweba, Gothenburg*

The new rolling mill demanded a separator system for the cooling water which contains a lot of ironoxid. A circular sedimentation basin was foundated 18 m below the factory area level, just beside a factory hall in operation and under a crane runaway.

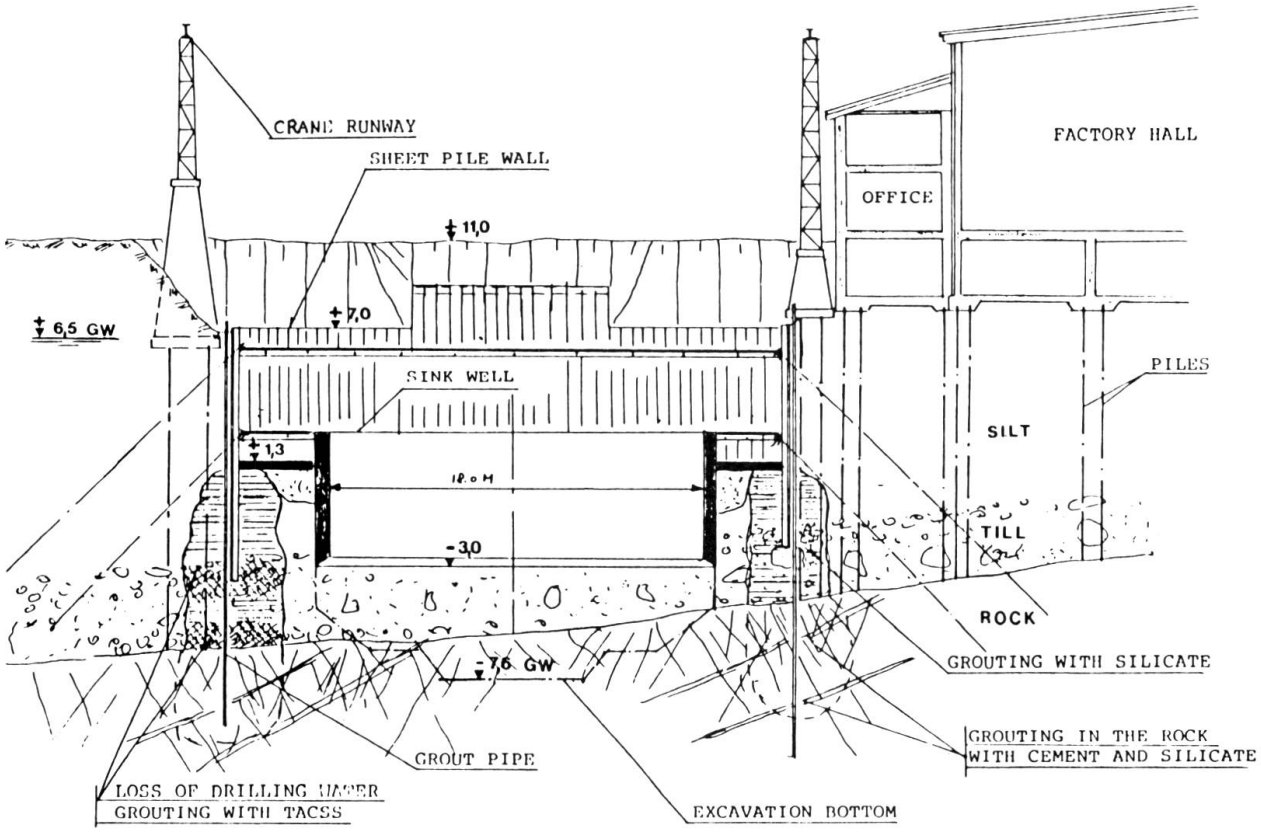
A pumping station was foundated at 11 meters depth.

Soil strata

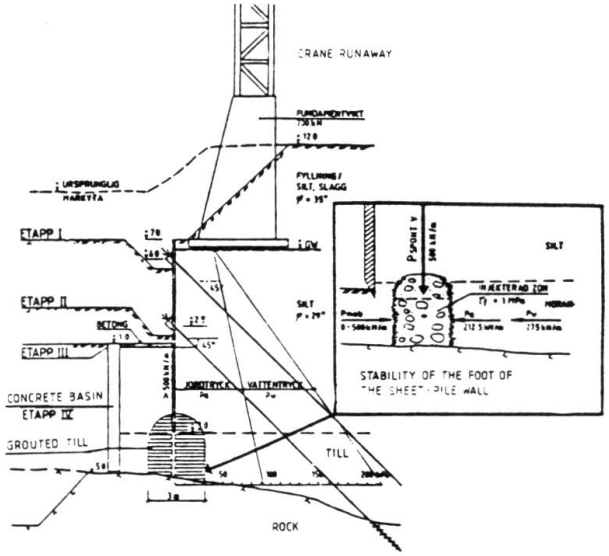
Elevation	*Depth*	*Soil*
+12 to +6	0–6 m	Filling of slag, sand and gravel
+6 to app. −2	6–14 m	Silt
−2 to −5	14–17 m	Till with boulers
−5	17 m	Rock, mainly granite

Planned construction method

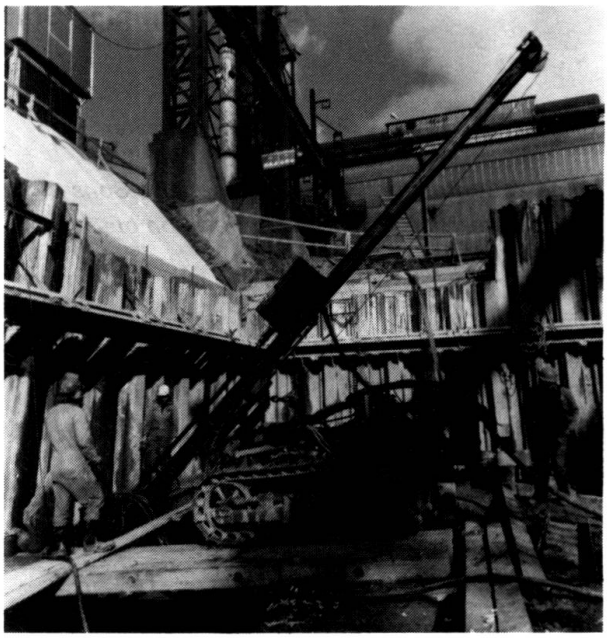
- Open cut down to +7 = 5 meters below the mill yard. At +7 the adjacent factory hall and the crane runaway are foundated. The groundwater level was also found at this level.
- Driving of a sheet pile wall to refusal on rock. If the sheet pile did stop earlier on boulders the vertical stability should be guaranteed by driving steelpiles in pipes welded to every third sheet pile.
- Anchoring the sheet pile wall by oblique wirecables grouted at least 3 meter in the rock.
- Sinking of a prefabricated circular concrete basin, 6 m in height, from elevation + i.e. 11 meters below the ground.
- Lowering of the groundwater tabel to the rock by means of sinkwells outside the sheet pile wall.
- Excavation of the rock in the deepest part of the basin by blasing.



SSAB Domnarvet Borlänge Steel Plant



Cut Through Sheet-Pile Wall



Drilling and grouting the anchors

Changing assumptions

The sheet pile wall consisted of Larssen IV profiles and every second pile a Larssen II profile. The Larssen II piles was driven to refusal 3–4 meters earlier than expected. Groundwater lowering gave a large influence area because of heavy leakage in open fissures and cracks in the rock.

The influence area gave risk for subsidences on sensible factory buildings and groundwater sinking was therefore abandoned.

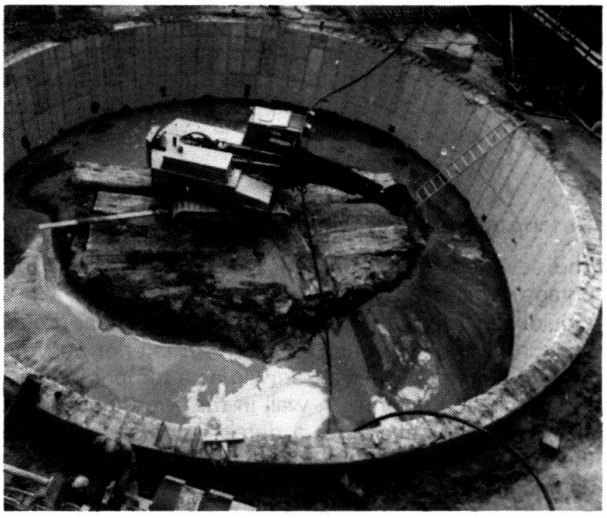
Final performance

The leaking rock under the basin bottom was grouted with cement and silicate.

The soil under the sheet pile wall was grouted with polyaretan gel, silicate and cement depending on the permeability of the soil indicated by the loss of the drilling water measured level by level.

The grouted soil had to withstand the vertical force from the sheet pile wall = 500 kN/m, and the horizontal earth and water pressure almost 600 kN/m.

As anchors, taking the horizontal force 500 kN/m, was used boring pipes fitted with temporary boring crowns. The pipes was drilled in place an grouted through the boring pipe.



Excavation during sinking of the concrete basin, ∅ 17 m; 16 m below the ground surface

The circular basin was fitted with pipes which made it possible to smear the outside with bentonite during sinking.

As a precaution the basin was possible to complete with vertical anchors for jacking the ring downwards.

(B. Göran Lindh)