

**TITAN POLSKA**



ISM 14TH INTERNATIONAL  
**WORKSHOP FOR MICROPILES**

GOLD COAST AUSTRALIA - AUGUST 21-23 2019



**Engineering  
Office**

**TITAN POLSKA**

# Museum of the Second World War in Gdańsk

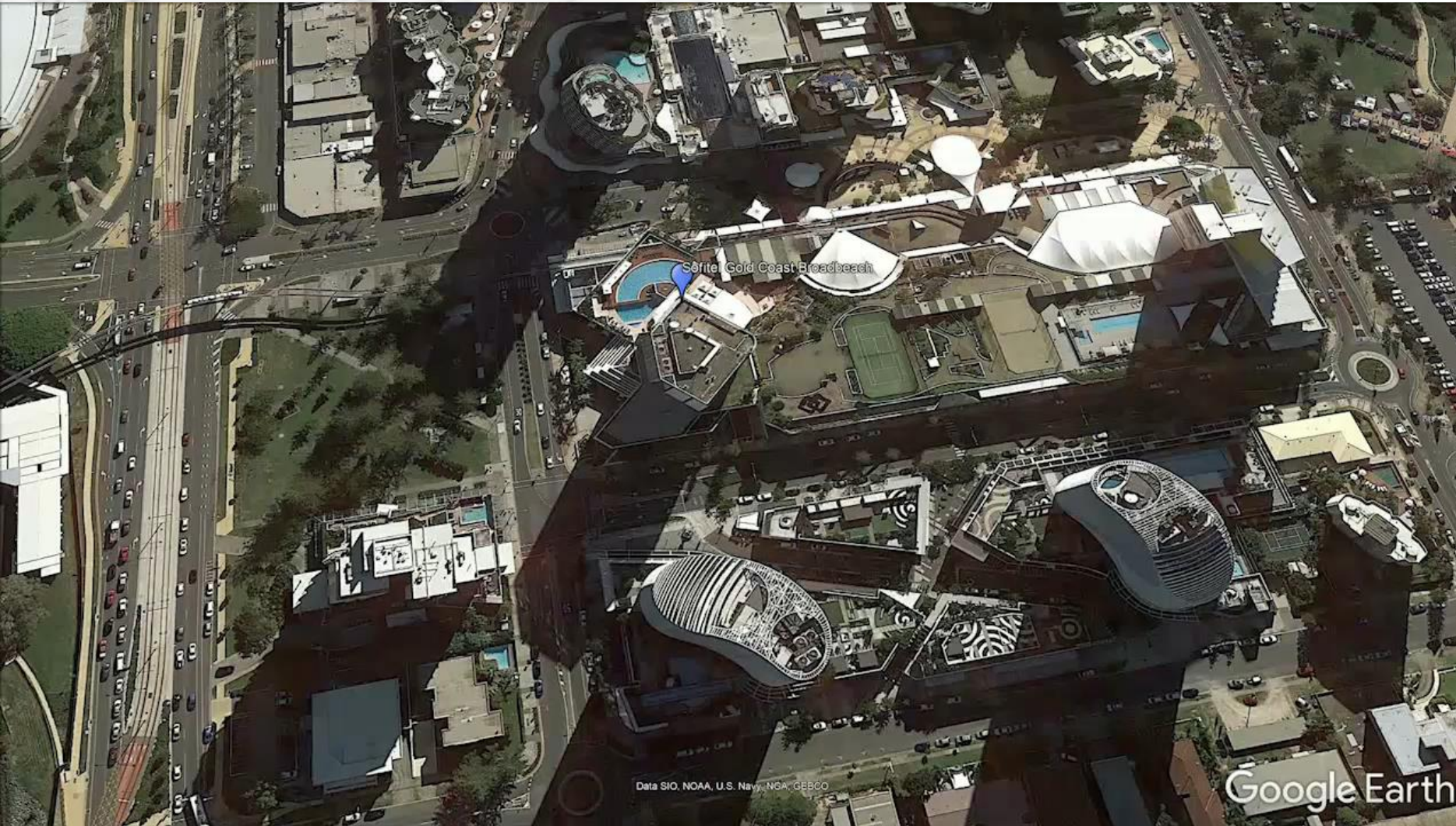
Natalia Maca



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# General information



- Museum of the Second World War
- Located in Gdańsk
- Northern Poland, Pomerania region
- The border of the historic city centre and the shipyard zone



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# General information



- Situated in a symbolic space: 200 m from the historic Polish Post Office and 3 km from Westerplatte Peninsula
- The site touches the Radunia Canal to the west
- The south side opens onto the Motława River

[www.google.pl/maps/](http://www.google.pl/maps/)



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# General information



- Architect: Studio Architektoniczne Kwadrat
- General Contractor (I stage): Soletanche Polska
- Project value: c.a. 110 000 000 EUR
- TITAN POLSKA's contribution:  
consultancy & supervision over slab anchoring, micropiles delivery

[architektura.muratorplus.pl](http://architektura.muratorplus.pl), Fot. Marcin Czechowicz



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# The vision



[www.muzeum1939.pl](http://www.muzeum1939.pl)

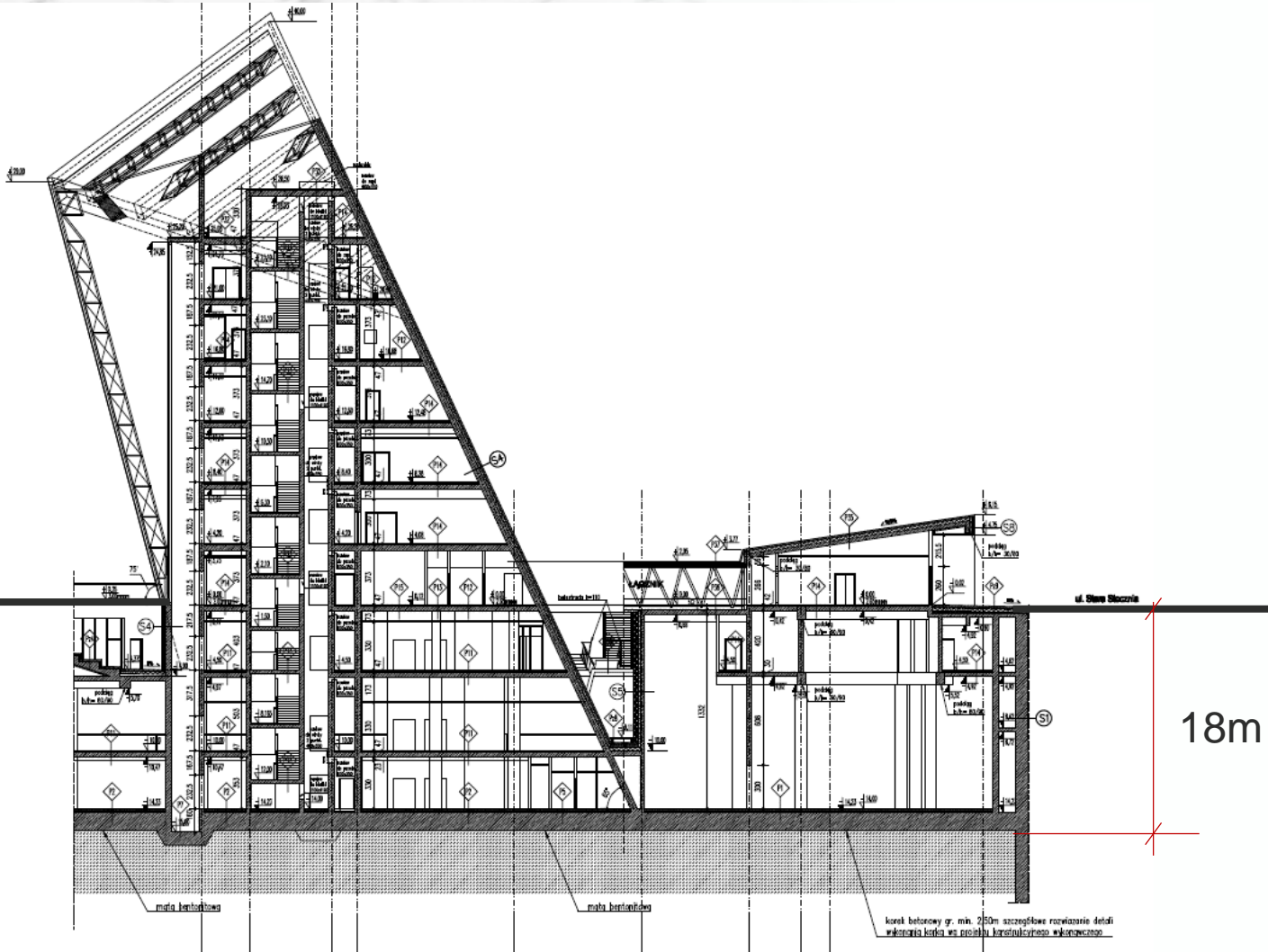


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# The vision



- The building located almost entirely underground
- 3 underground storeys
- 17 000 sq m lot
- Construction works carried out in a dry pit

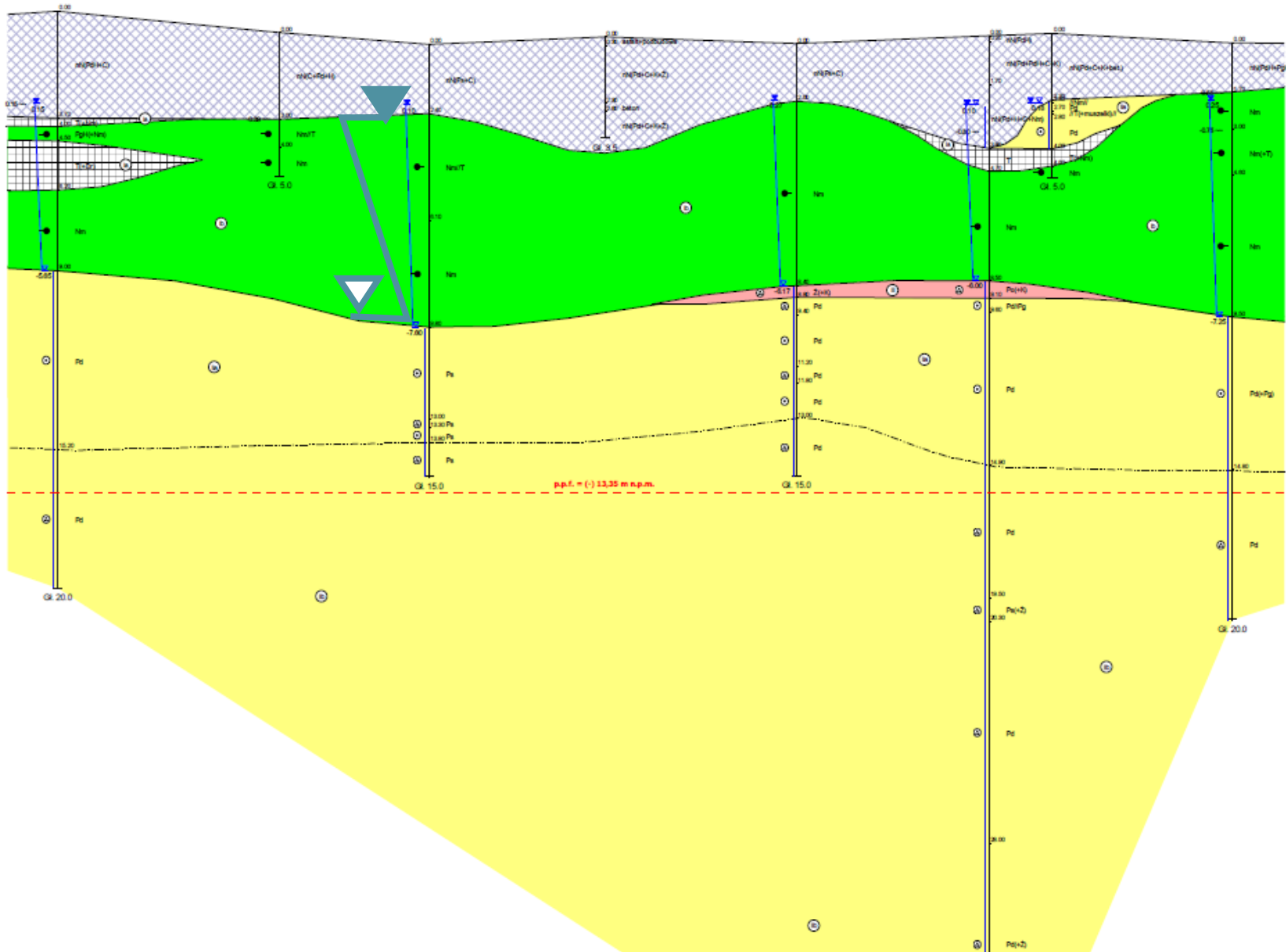
→ The excavation on the whole area of the plot with depth up to 18 m



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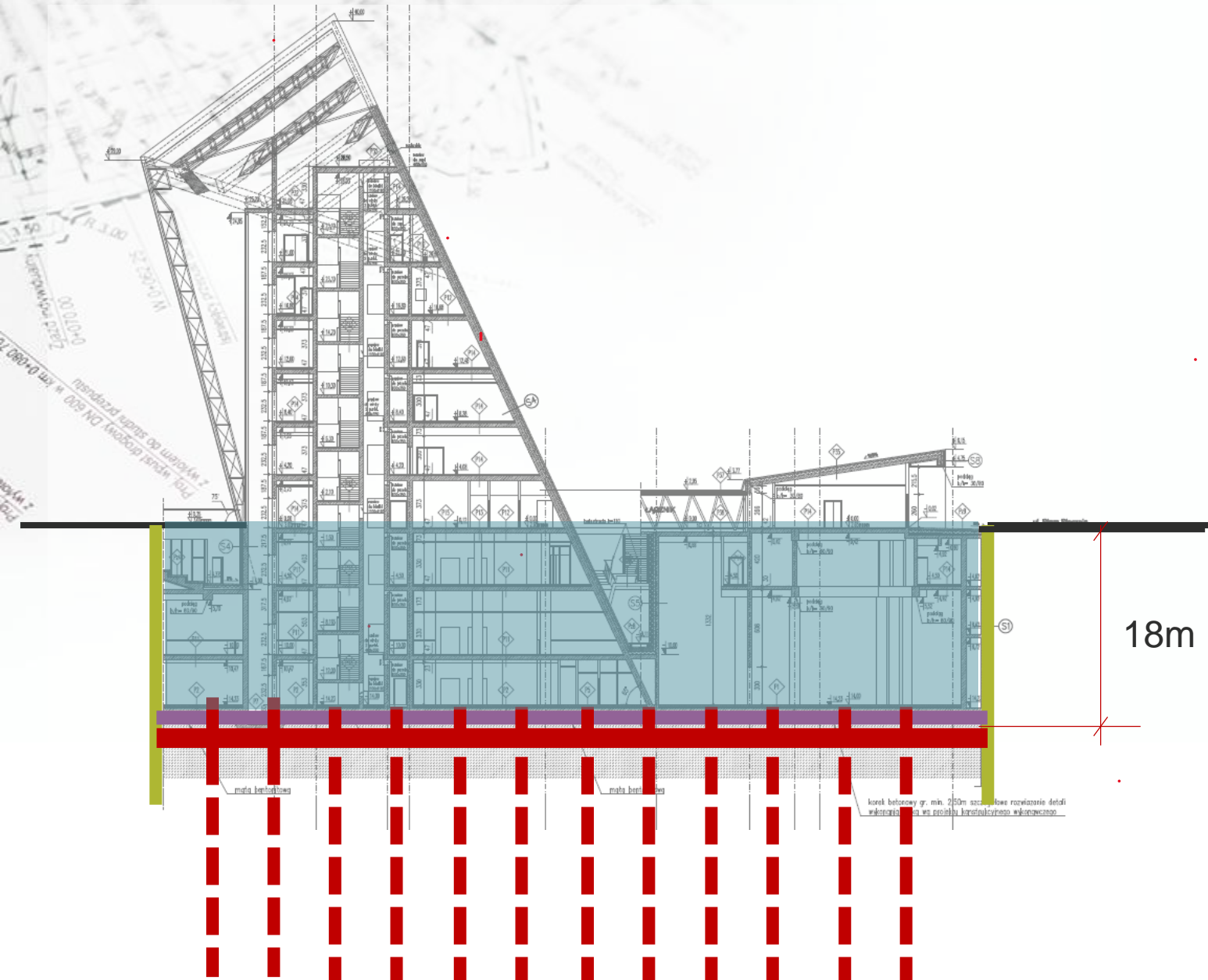
# Geotechnical conditions



- 0,0 – 1.7/3.9m bgl - embankments
  - Up to 7.4/11.0m bgl - peats and muds
  - Up to 30m bgl – fine and medium sands of medium density
  - Below – compacted mixture of sand and gravel
- 
- Ground water drilled below the organic soils and stabilized 1.8m bgl



# Challenges

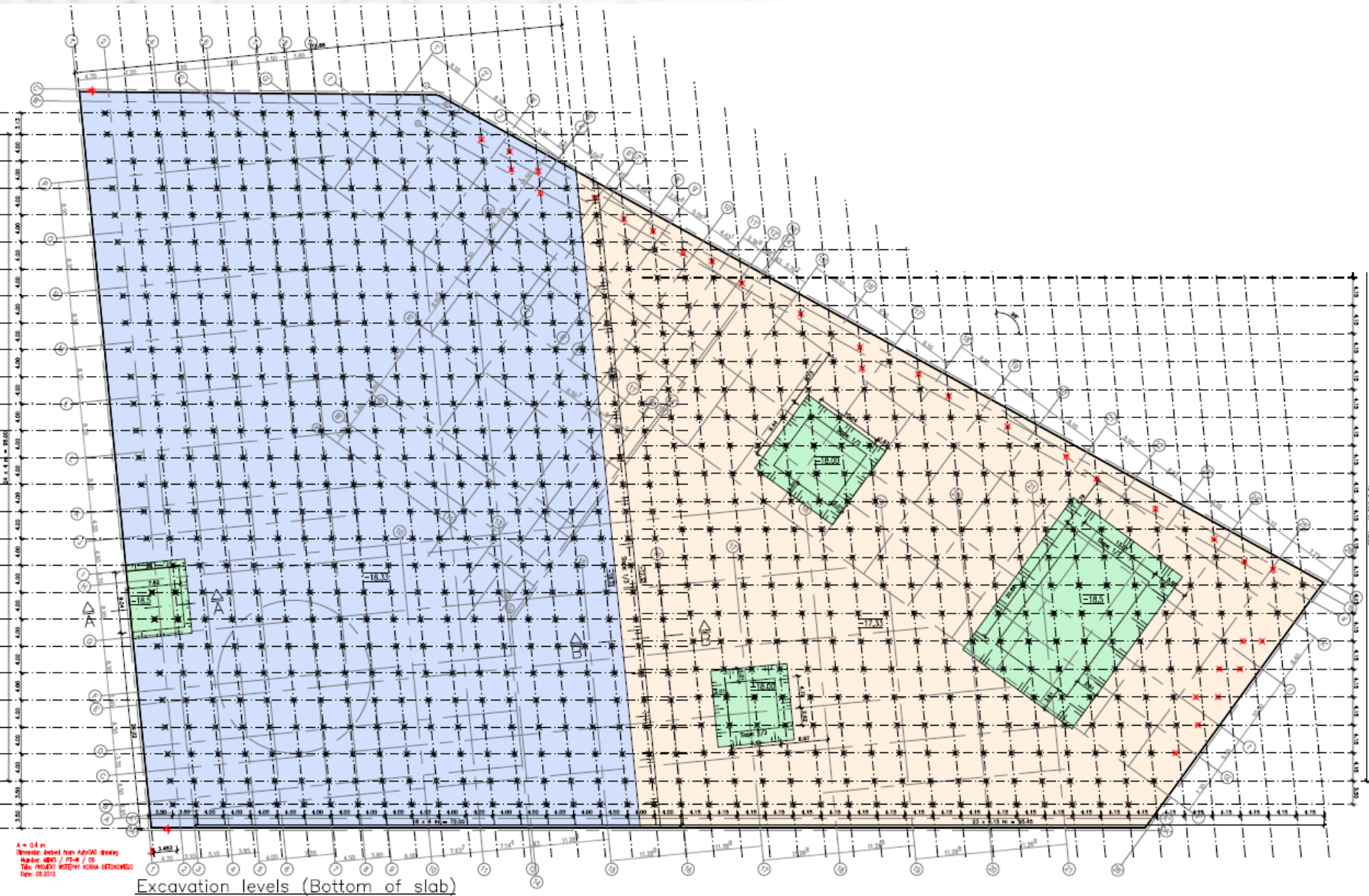


- Anchoring the slab against uplift
- Anchoring the water stop in the dry pit stage (16m water column pressure)
- Access only from water (in 18m deep excavation with water level 2m bgl )
- Technical, executive and logistical difficulties
- Tight schedule





# Challenges



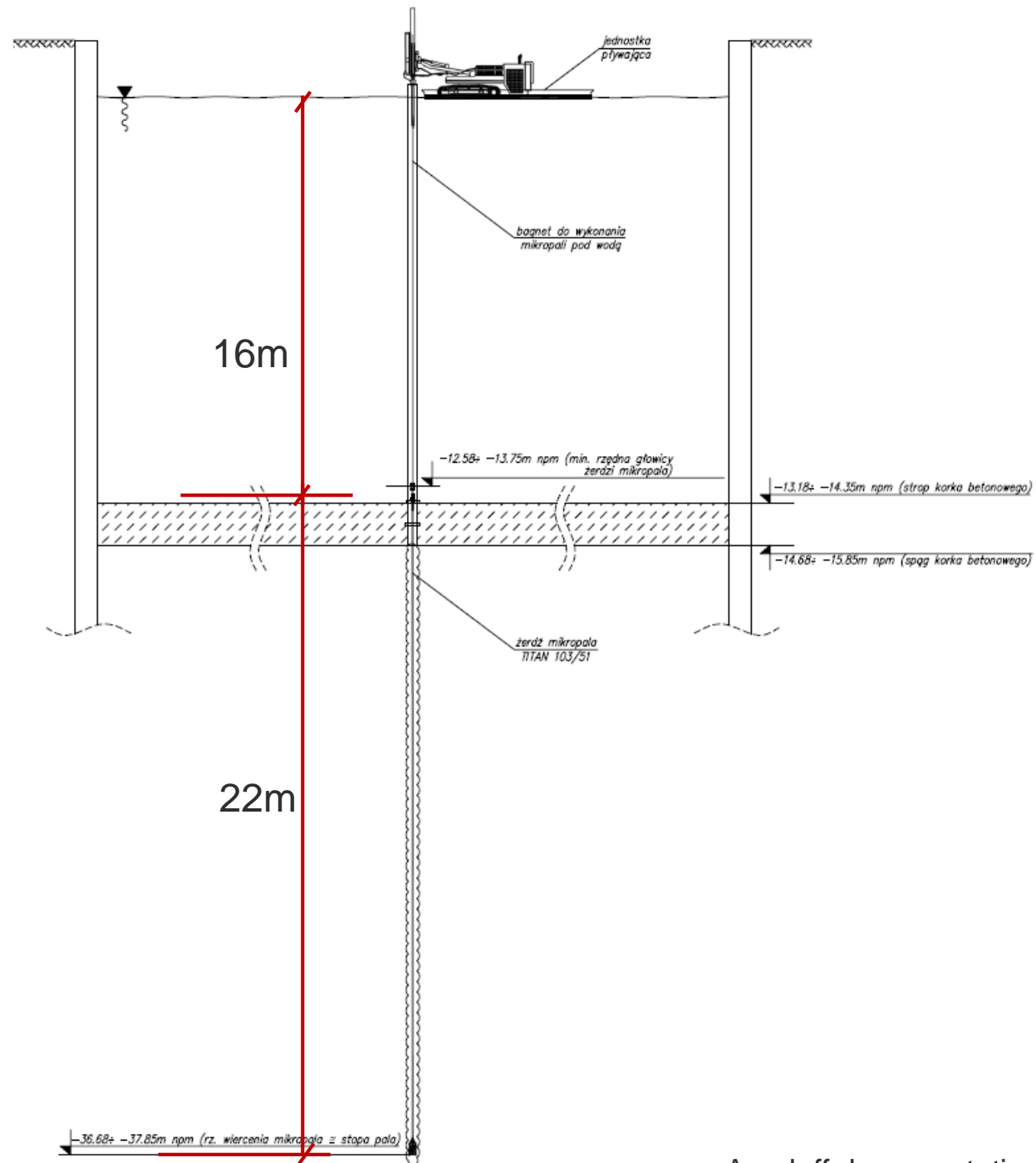
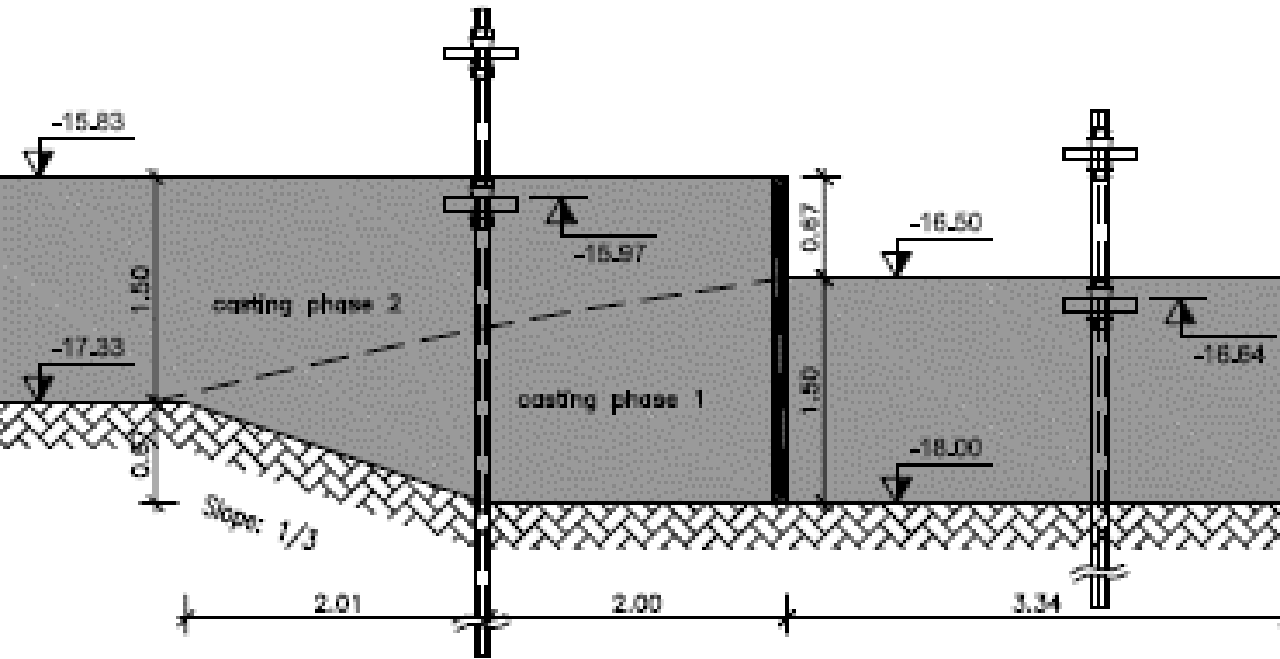
- TITAN 103/51 D=220m  
- 914 pcs
- Grid of 4 m x 4 m
- Working load:
  - 2 300kN temporary phase
  - 1 690kN permanent phase
- The lifespan 100 years
- Installed by Aarsleff Sp.z o.o. (provides the technical desing) and Soley Sp.z o.o.



# Challenges

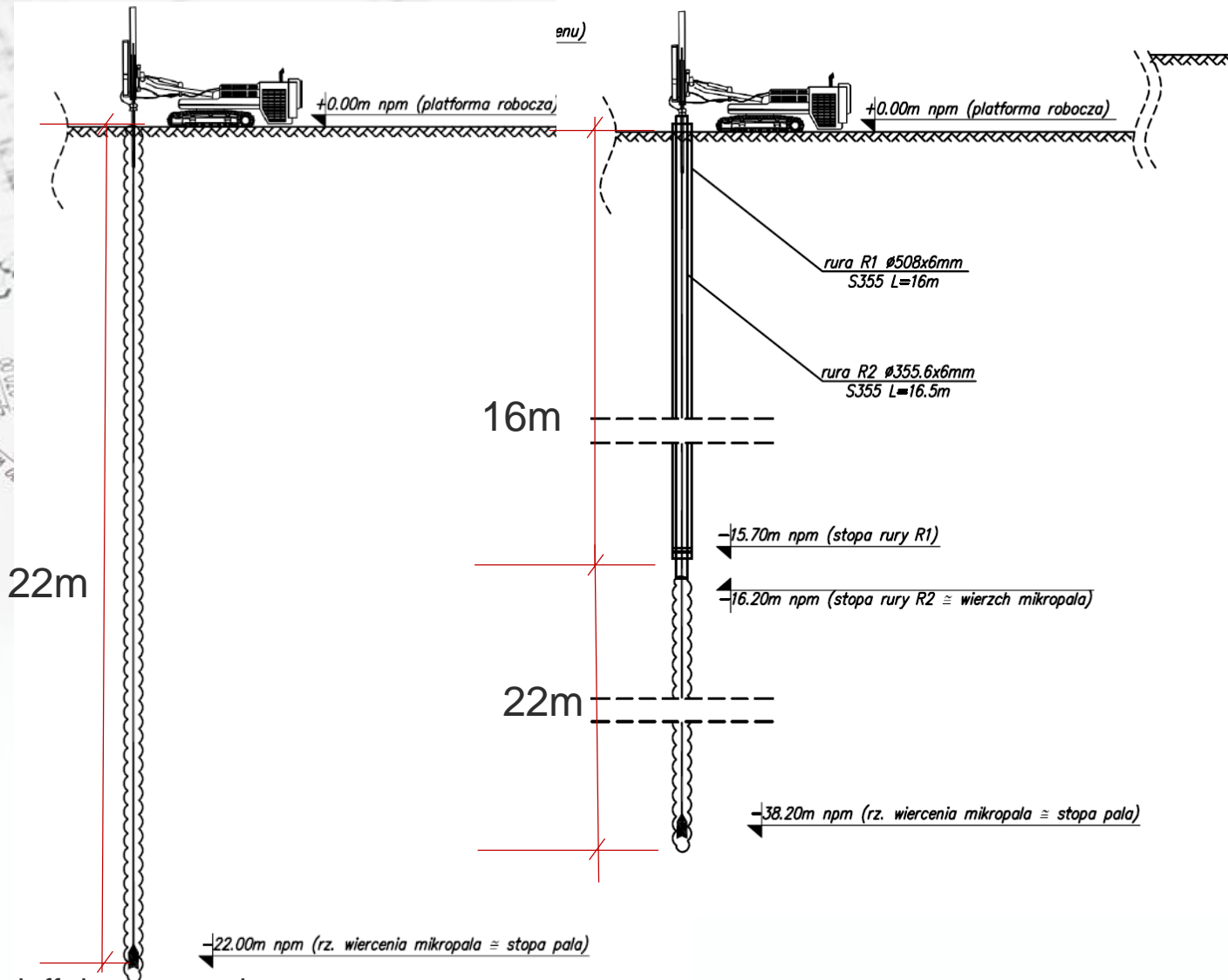
bottom level -17.33m / -18.33m

working length 22m + empty passage 16m  $\rightarrow L_{tot}=38m$





# Suitability load test



3 micropiles L=22m

3 micropiles L=38m with 16m of „free length”

127/103 hollow bar + 73/35 hollow bar inside

Design load 1200kN and 2100kN – displacement < 12mm and < 35mm

Maximum test load 3280kN – displacement < 130mm and < 75mm

Aarsleff documentation



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# Installation from floating units





# Installation from floating units





# Installation from floating units

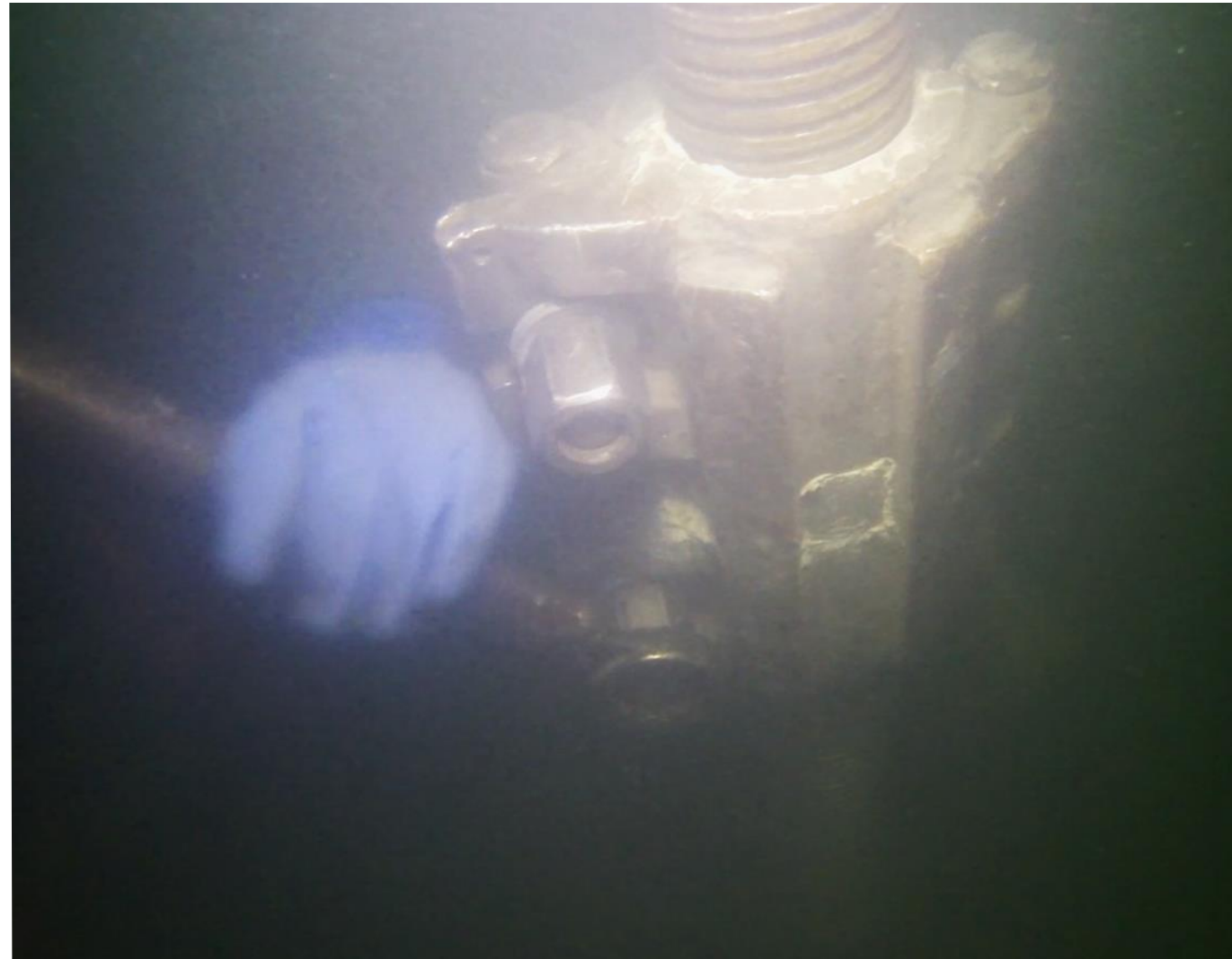


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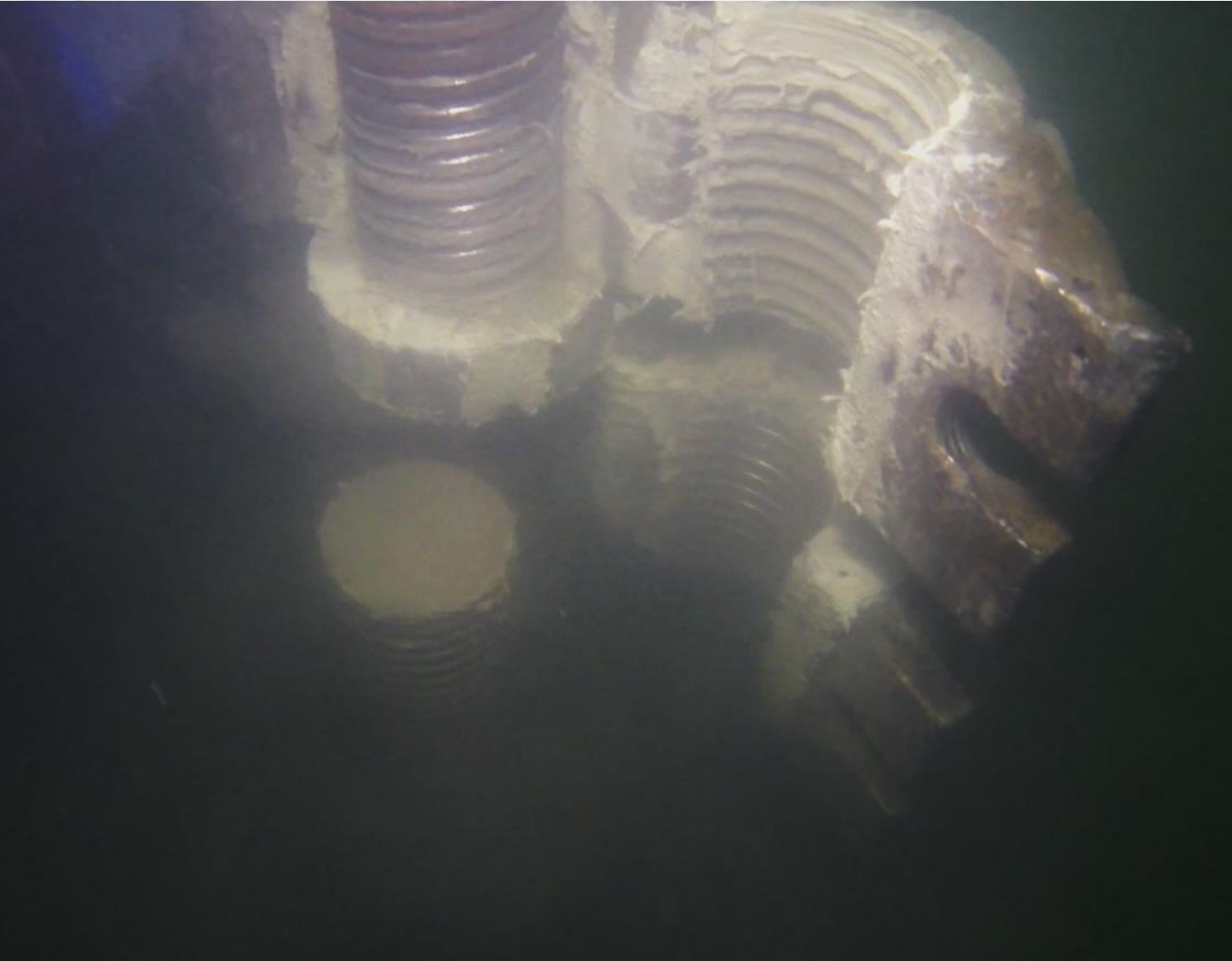
# Installation from floating units



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# Installation from floating units

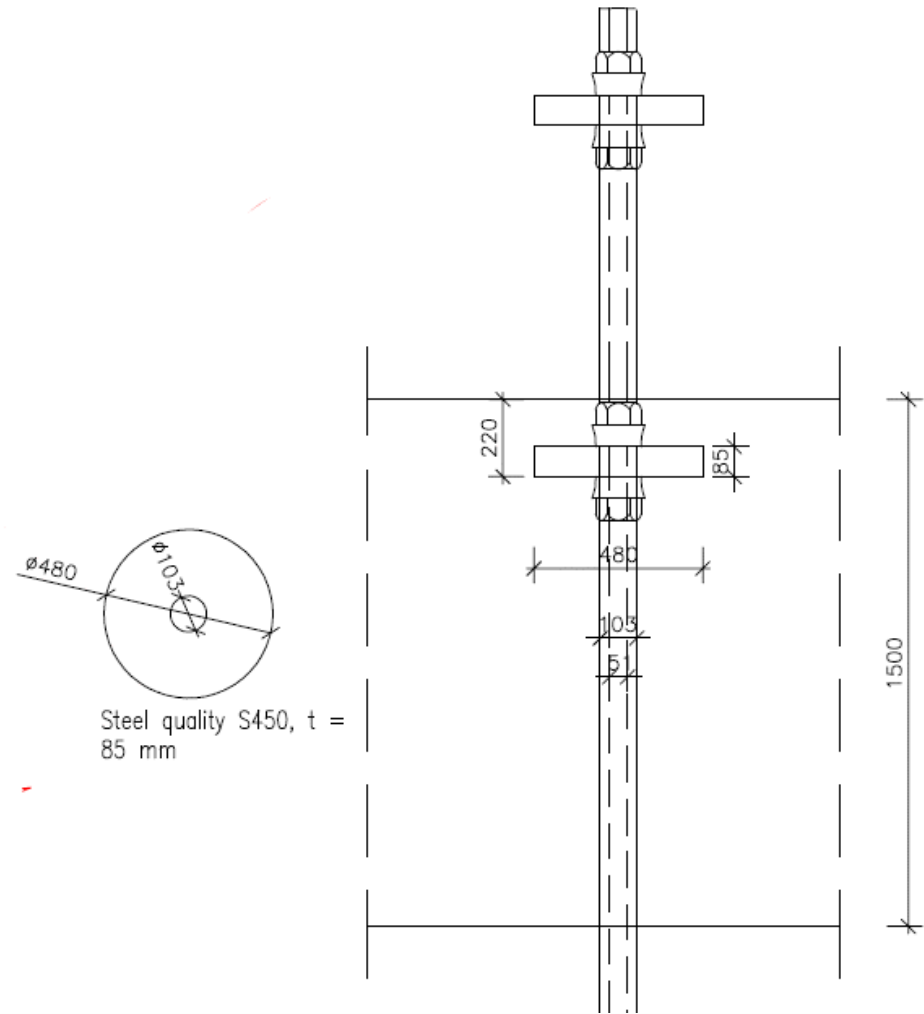


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# Installation from floating units



# Installation from floating units



how

- Sublime? Simple? technical solutions
- Good work organisation
- Close cooperation of all participants

what

- 100-120m day/work team
- in total 22 000 m in 14 weeks (most works carried out in winter)

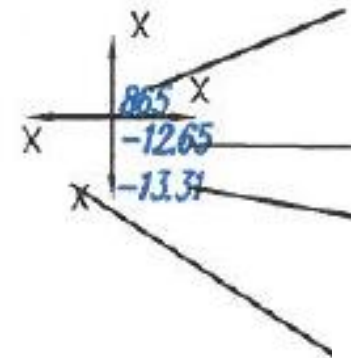
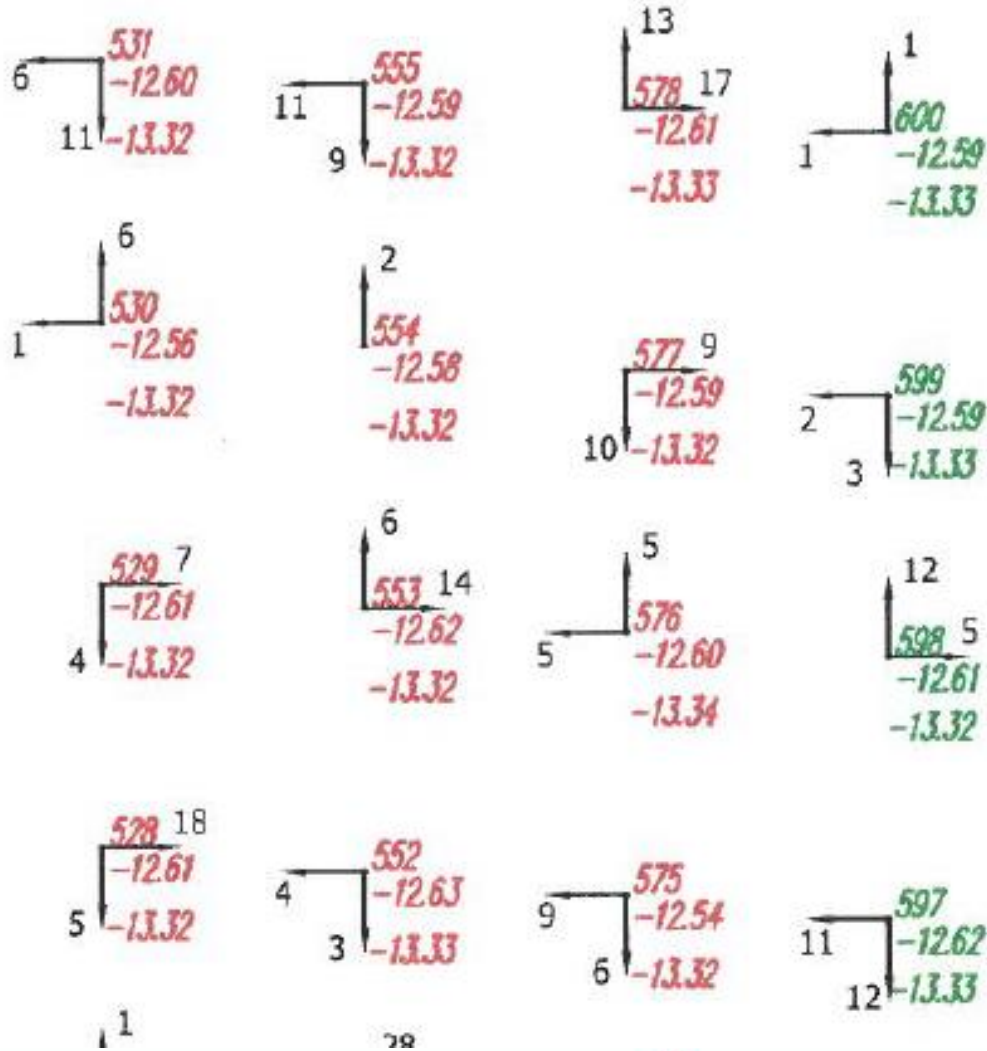


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# Deviations



Pile number

Hollow bar level

Washer plate level

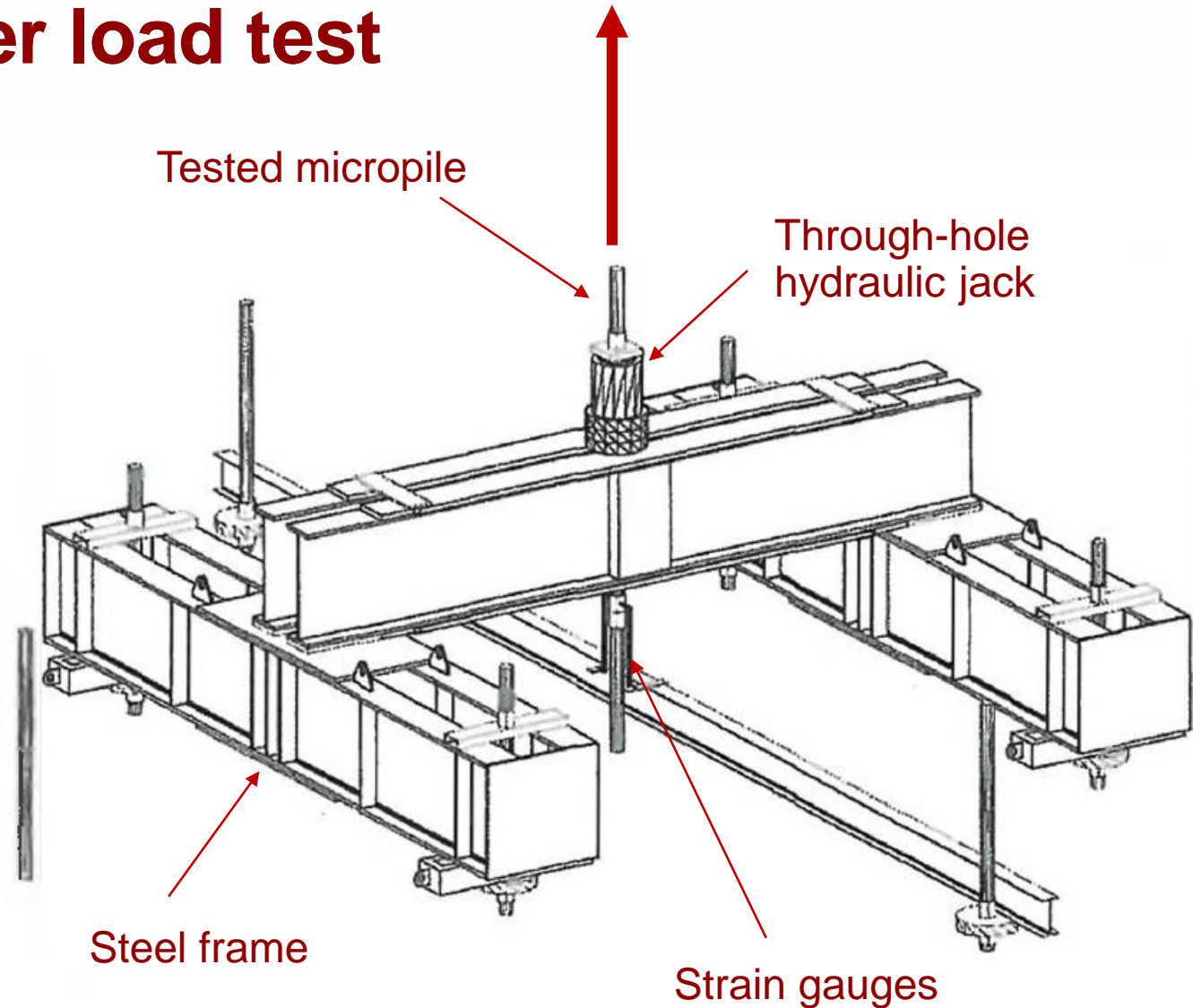
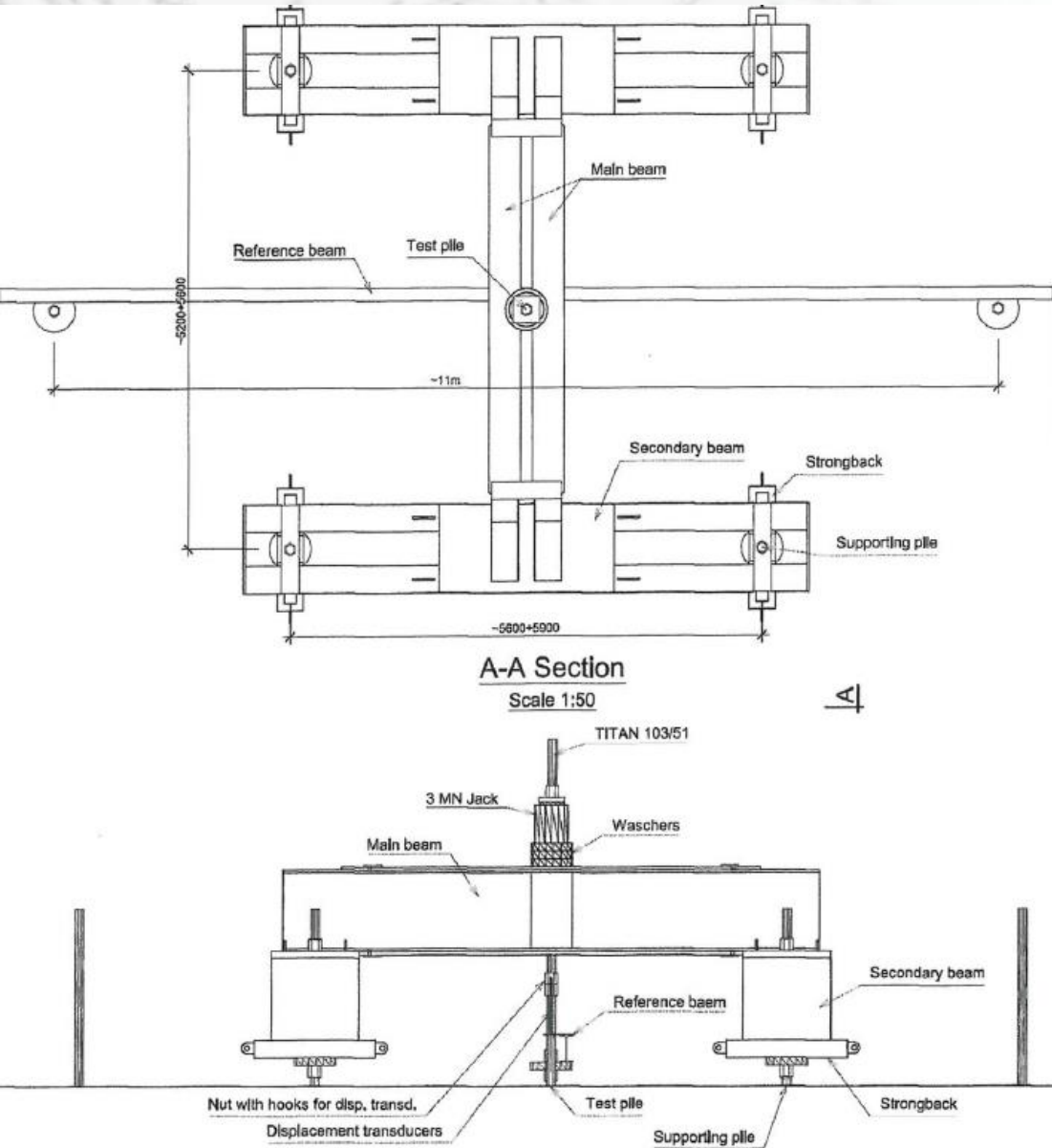
Value and directions of deviations of the plan location



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# Acceptance underwater load test



Piletest documentation





# Acceptance underwater load test



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# Acceptance underwater load test



- Test load 2300kN
- Displacement <25mm
- Stabilization in 30-40min



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# Underwater concreting



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# Dewatering and dry pit



muzeum1939.pl



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# First exhibits



[muzeum1939.pl](http://muzeum1939.pl)



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# Museum of the Second World War today

You are most welcome!



Jorepstorff, wikipedia.org

muzem1939.pl





# Summary



*Before anything else,  
preparation is the key to  
success.*

Alexander Graham Bell

See movie [on our vimeo](#)

# Thank You for your kind attention

Special thanks to Soletanche Polska Sp. z o.o., Aarsleff Sp. z o.o., Soley Sp. z o.o. and Piletest Sp. z o.o. for successful cooperation and providing the documentation

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