

Designing the separation of the combined sewer system in the Murcki district of Katowice.

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25th May 2023

Murcki district of Katowice

Katowice is the capital city of the Silesian Voivodeship in southern Poland and the central city of the Upper Silesian metropolitan area. It is the 11th most populous city in Poland, while its urban area is the most populous in the country and one of the most populous in the European Union. Katowice has a population of 286,960.





Description of the project

In 2019, design office SANKAT began designing the separation of the combined sewer system in the Murcki district of Katowice, the largest city in the Upper Silesian and Zagłębie metropolitan area.

The scope of works covered the diameters in the range of DN300 – DN500mm.

The condition of the existing sewer was very poor and caused many operational problems such as sedimentation and leaks.

Description of the project

The entire project consists of 89 investment tasks (including civil works, supplies and services).

Within the framework of the project, more than 90 kilometers of sewer networks have been or will be constructed and upgraded, using both traditional and trenchless technology.

The expected total cost of the Project is more than PLN 345.235.154,06 (76.530.577,52 €)
Granted funding for the Project in the amount of PLN 175.461.515,62 (38.895.723,58 €)

Description of the project

The investment was aimed at separating wastewater through the construction of a new sanitary sewer network and the adaptation of the existing combined sewer system to a rainwater drainage system.

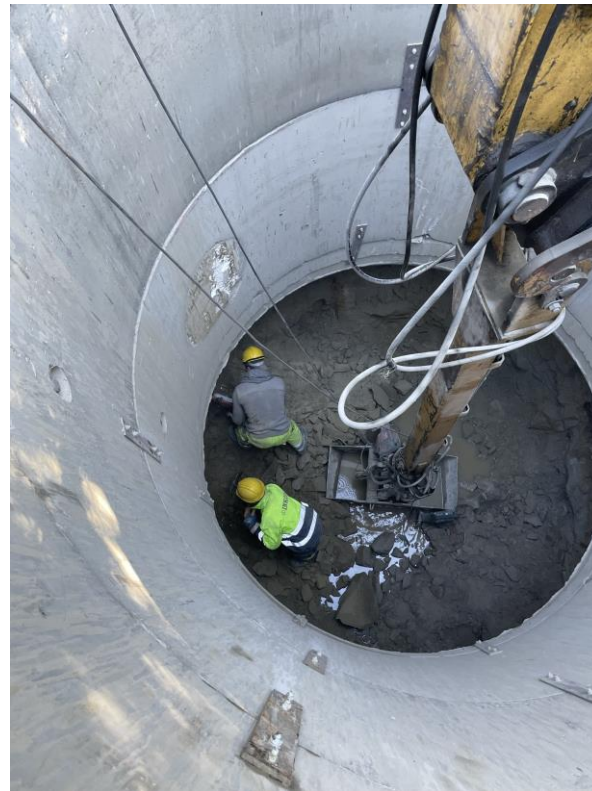
Gravity sewers constructed using trenchless methods (drilling, jacking, microtunnelling) were to be made of polymer concrete, vitrified clay, basalt or reinforced concrete pipes. The decision to use a particular material was left to the contractor.

Project criticalities

1. cover depth over then 4,5 meters
2. a lot of rock in the ground
3. crossing highway
4. mining area

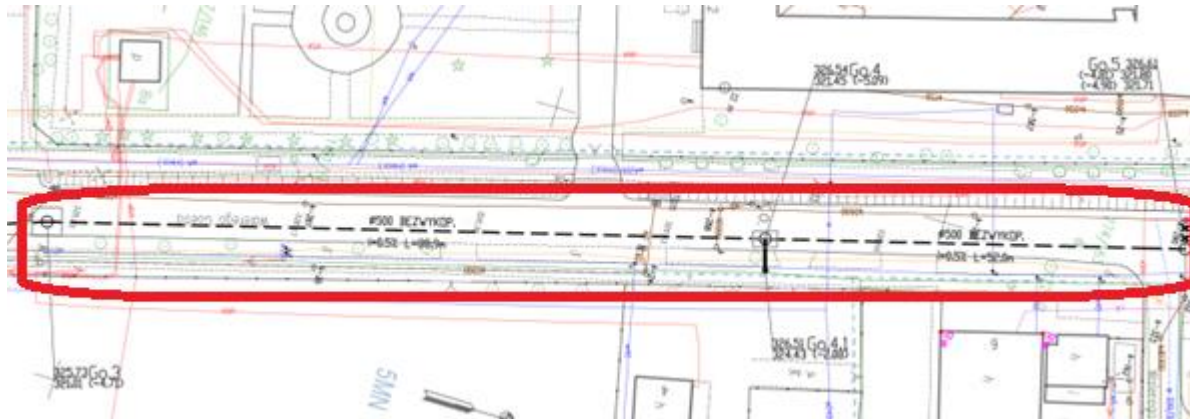
Project criticalities

2. a lot of rock in the ground



Project criticalities

3. crossing highway



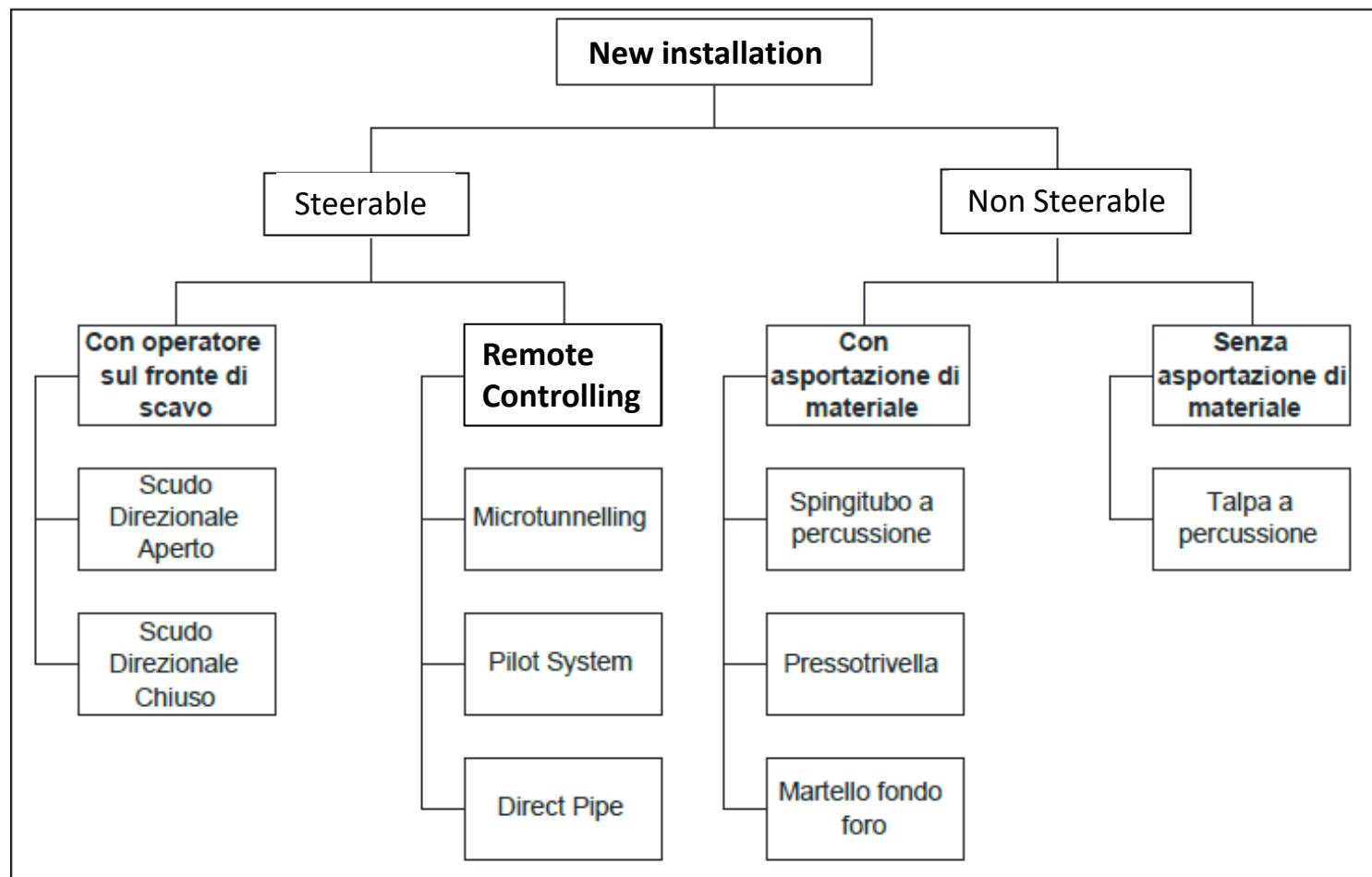
Project criticalities

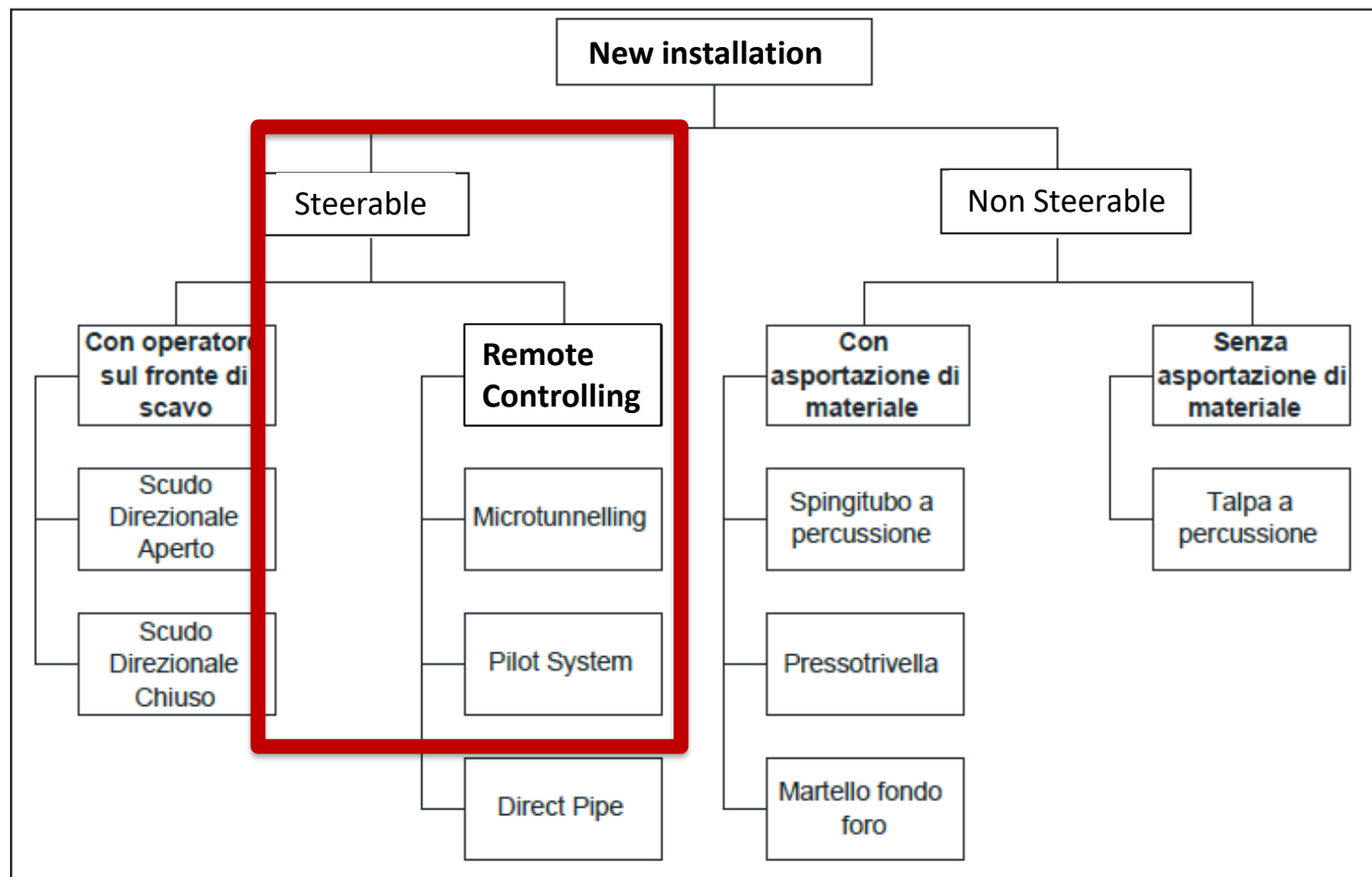
4. mining area - III category

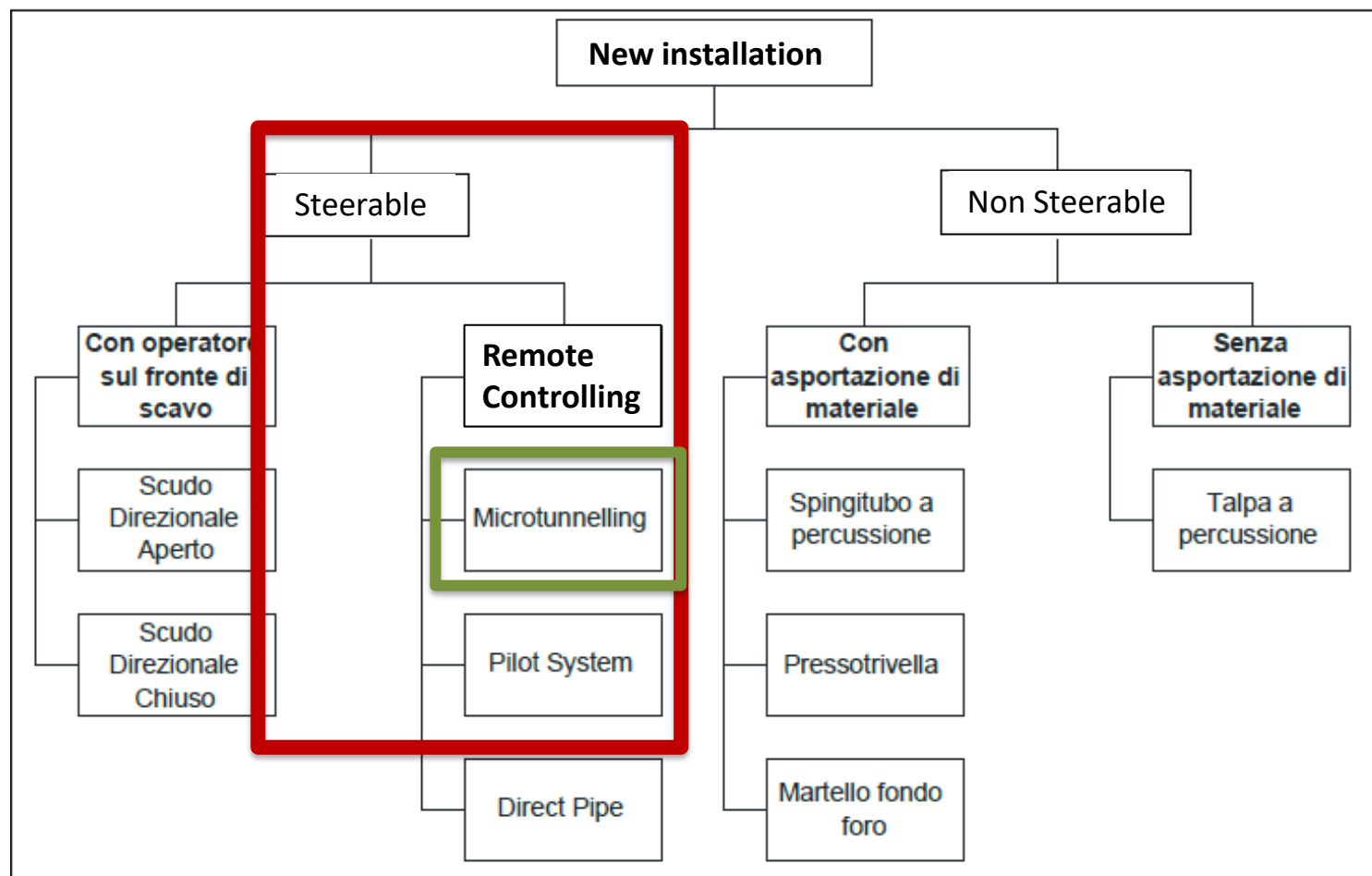


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Microtunnelling with slurry system

For microtunnelling, hydraulic slurry machines are used. They are equipped with a cone-shaped crusher, whereby the excavated material is crushed and conveyed into a chamber behind the milling head (slurry chamber). The fluid (water or bentonite) fed into the milling chamber mixes with the excavated soil, and the resulting slurry is pumped out through pipes and conveyed to the separation plant on the surface.





Microtunnelling with slurry system

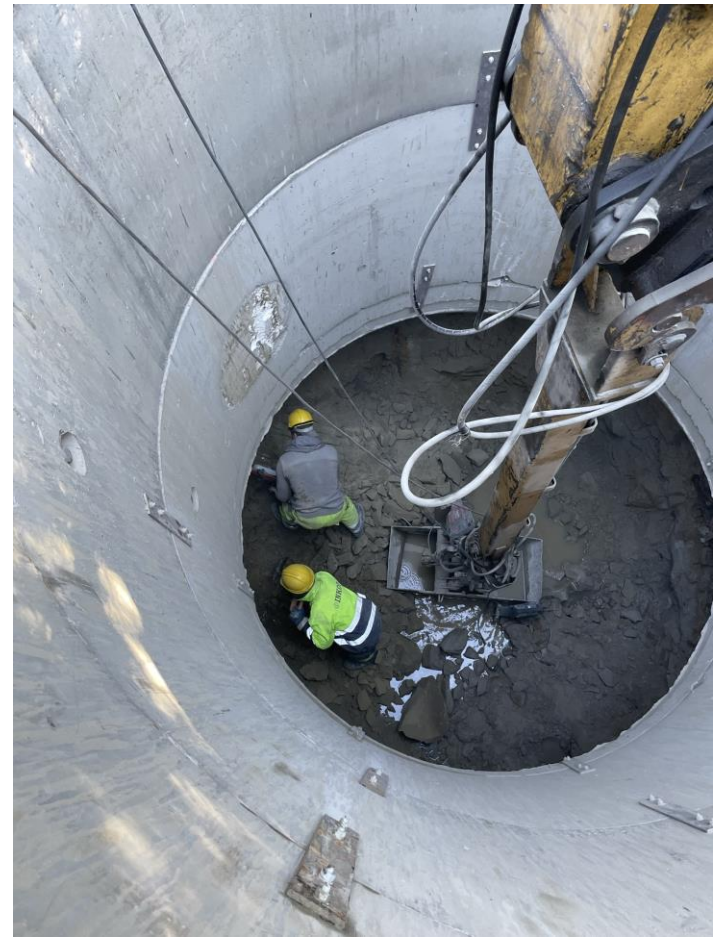
- 1) Insertion of the vitrified clay jacking pipes directly behind the jacking machine.
- 2) Guidance of the jacking machine by guidance cylinders in the cutting head.
- 3) Laser measurement with target board and geolaser.
- 4) Removal of soil at the cutting face by the cutting wheel.
- 5) Removal of the soil by slurry shields .
- 6) Separation of soil and water in the separation plant .
- 7) Recovery of jacking machine in the target pit.



Construction of the shaft, they are generally built in concrete using diaphragms or sheet piling, or prefabricated self-sinking

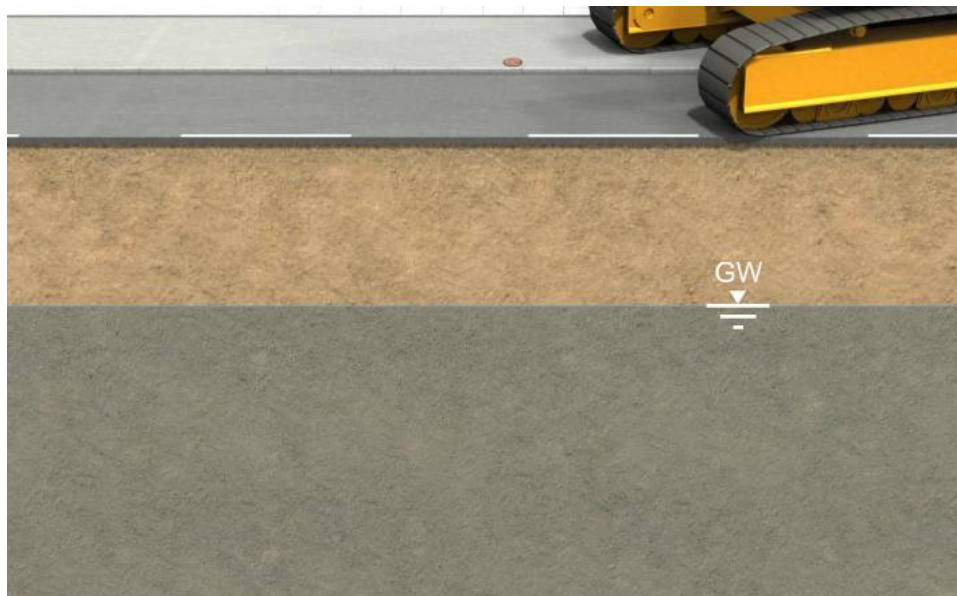


Dimensions	Start shaft internal diameter or length x width	Target shaft internal diameter or length x width
ID 150 Pipe with 1.00 max. length	ID 2000/1500 2,00 m x 1,50 m	ID 1500 1,50 m x 1,00 m
ID 200 to ID 400 Pipe with 1.00 max. length	ID 2000 2,50 m x 2,00 m	ID 2000 1,50 m x 1,50 m
ID 250 to ID 800 Pipe with 2.00 max. length	ID 3200 4,00 m x 3,00m	ID 2600 3,00 m x 2,50 m

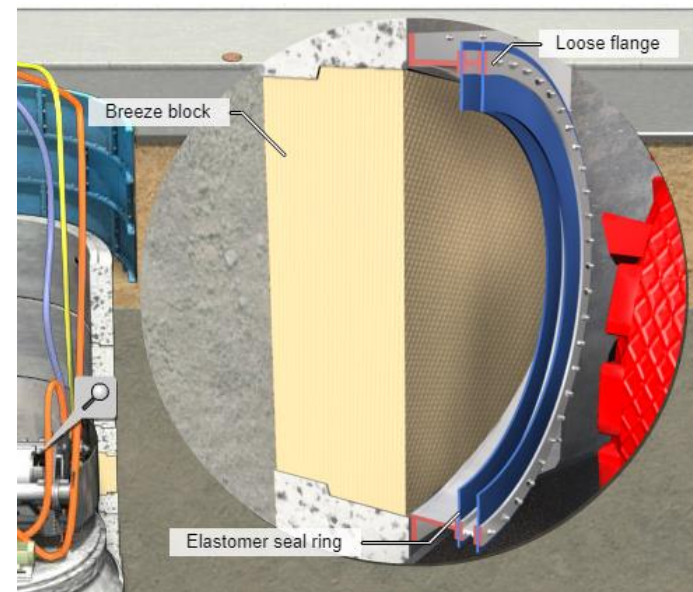


Slurry shield microtunnelling (on-site procedure)

Phase 1: Building the shaft

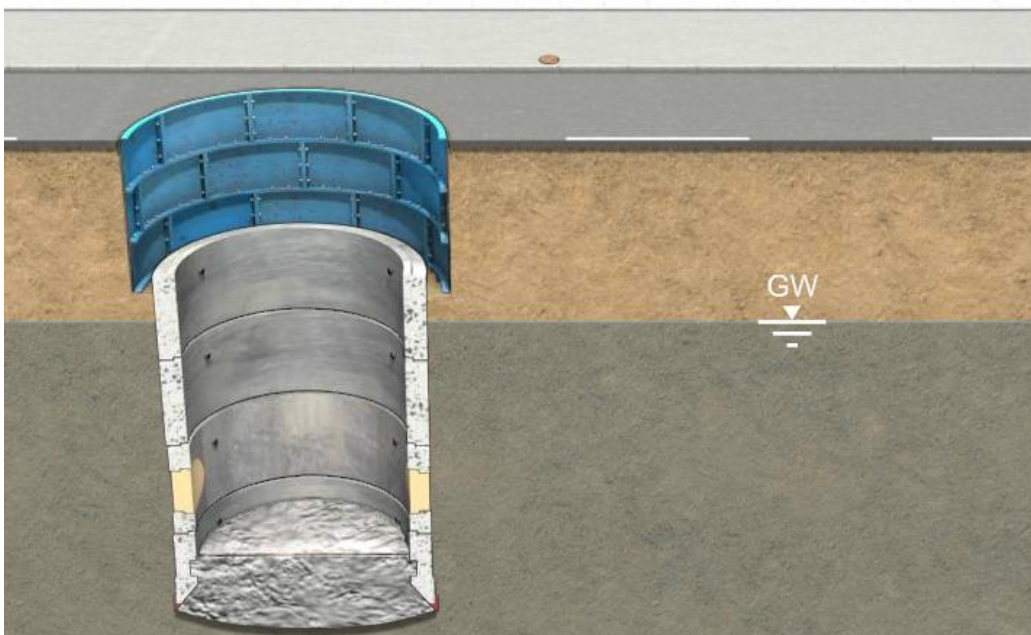


Source: Virtuelle Baustelle, Unitracc.de

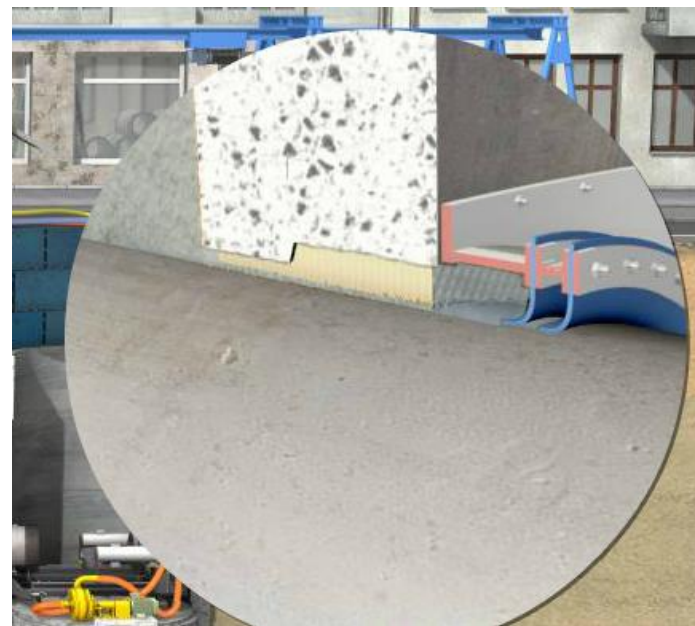


Slurry shield microtunneling (on-site procedure)

Phase 2: preparation of the equipment and jacking the pipes

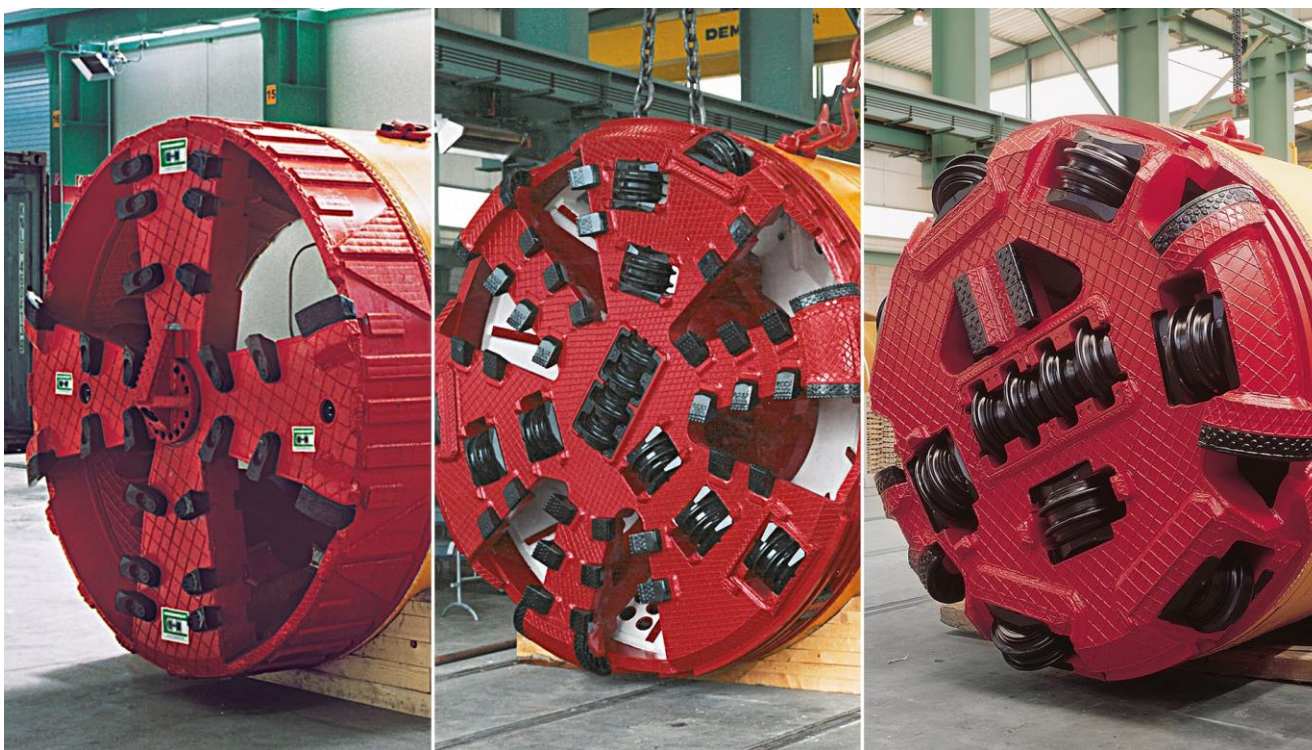


Source: Virtuelle Baustelle, Unitracc.de



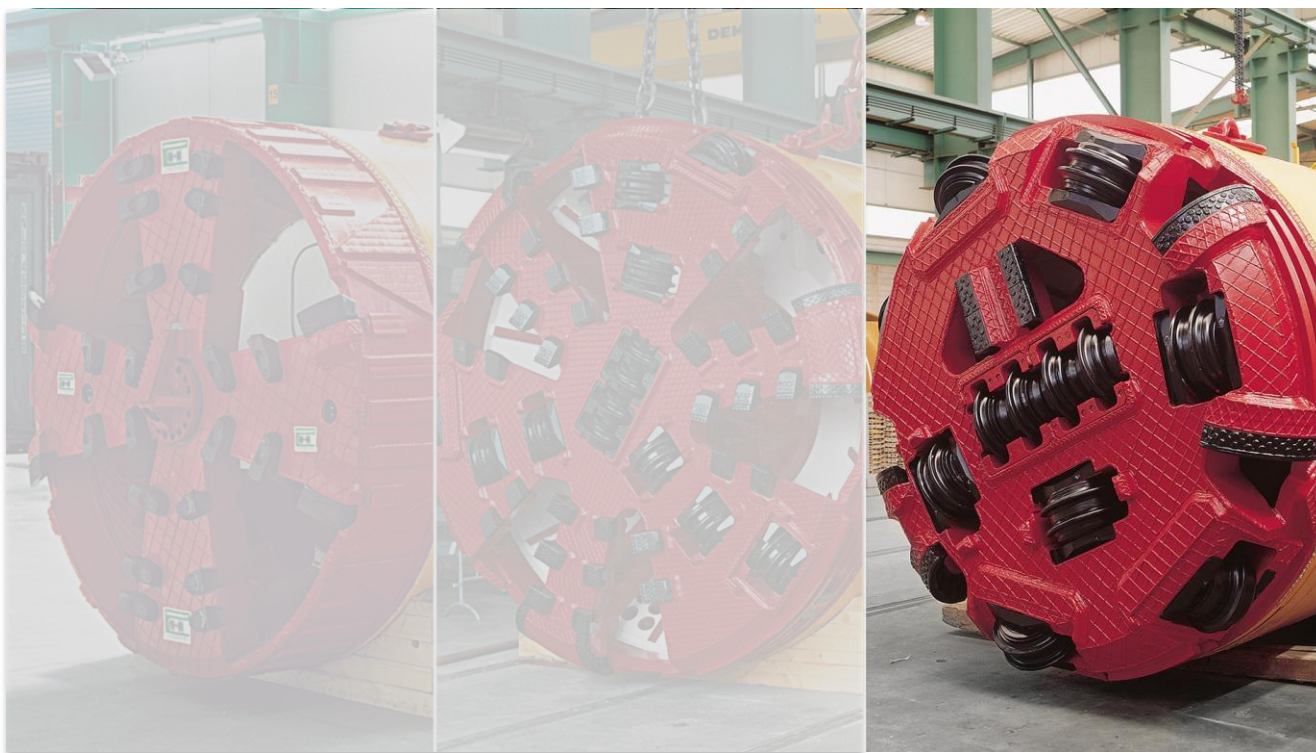
The contractor company Inkop implemented the trenchless technologies from March to November 2022.

Difficult ground conditions and rock interbeds forced the contractor to use microtunnelling machines Herrenknecht AVN400 and AVN500.



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Choosing the pipes

The choice of clay jacking pipes was influenced by its high strength parameters, very long service life of well over 100 years and the positive experience of the contractor and the investor from previous investments.



Technical characteristics

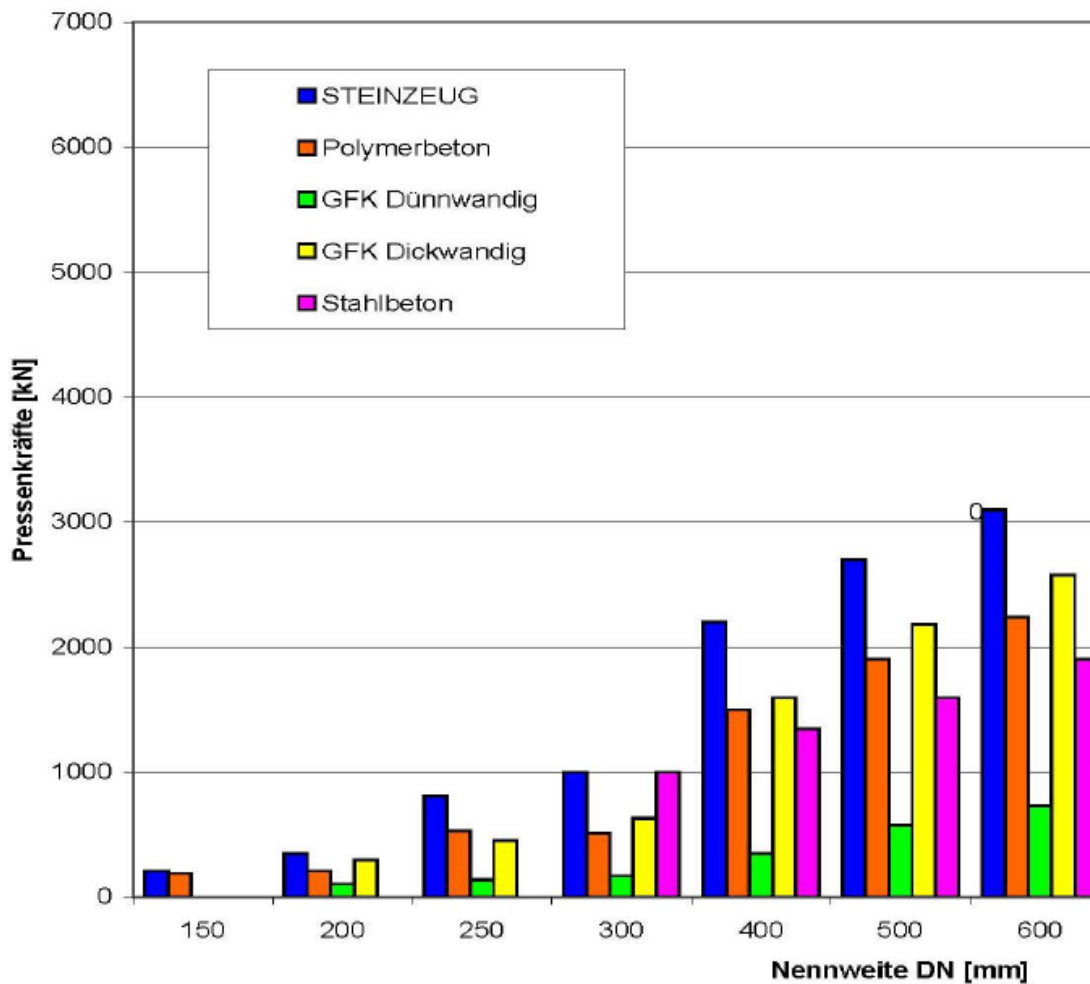
- ✓ High mechanical strength characteristics
- ✓ Low axial deformability
- ✓ Geometry suitable for thrust
- ✓ Jointing system suitable for thrust

+

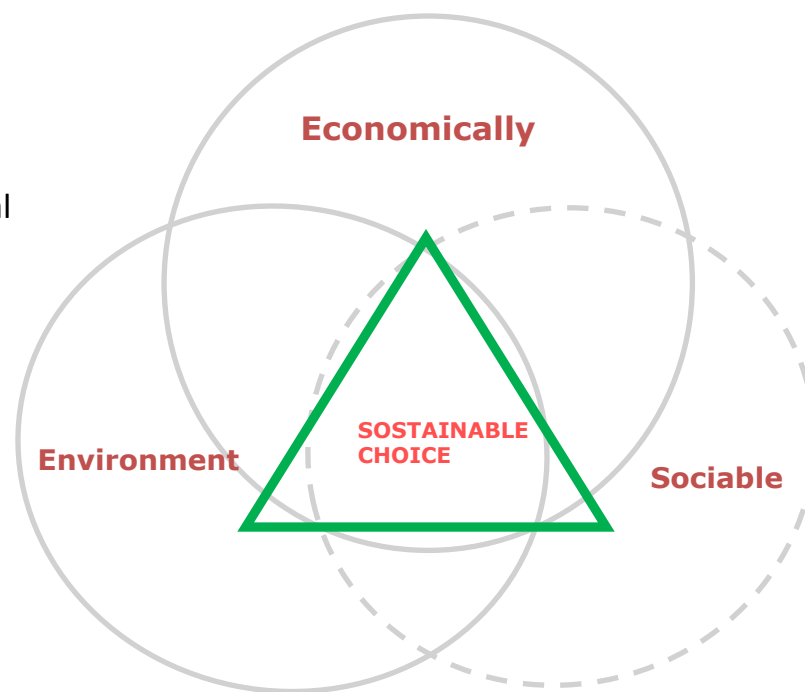
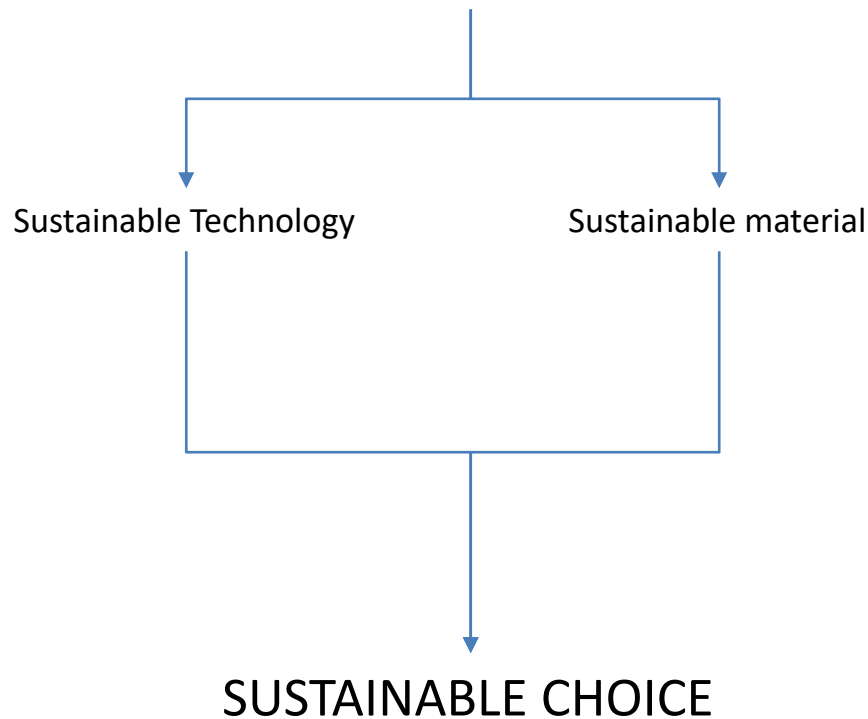
- ✓ Resistance to chemical aggression
- ✓ Hydraulic tightness
- ✓ Resistance to abrasion



Technical characteristics – Jacking force



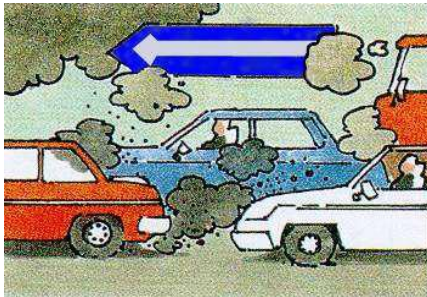
MICROTUNNELING WITH CLAY PIPES



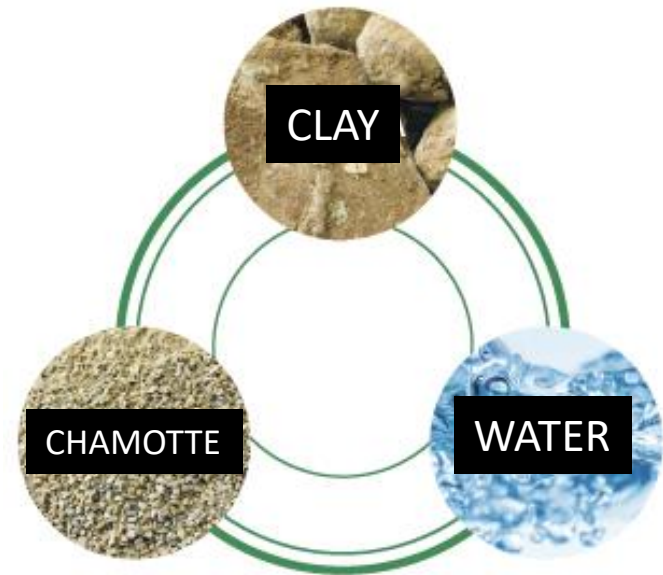
ENVIRONMENTAL SUSTAINABILITY



TECHNOLOGY



MATERIAL

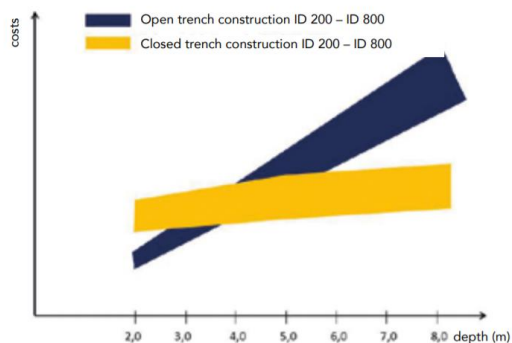


ECONOMIC SUSTAINABILITY



TECHNOLOGY

COSTS AT A GLANCE



MATERIAL

B.6

Economia

La lunga esperienza con i tubi e gli elementi complementari di gres per gli impianti di raccolta e smaltimento di acque reflue che soddisfano i requisiti della serie di norme EN 295 dimostra che la normale vita di impiego è di almeno 100 anni.



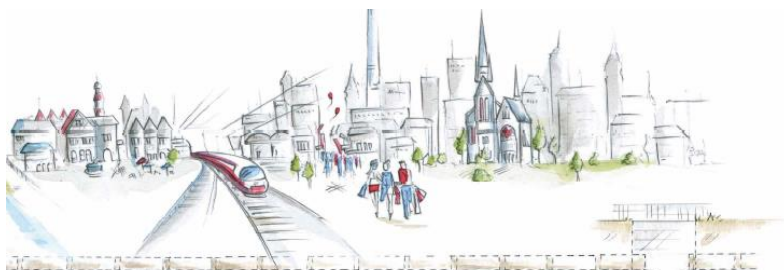
CENTRO DI RICERCA E SPERIMENTAZIONE
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SOCIAL SUSTAINABILITY



TECHNOLOGY



MATERIAL



THANK YOU FOR YOUR ATTENTION

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