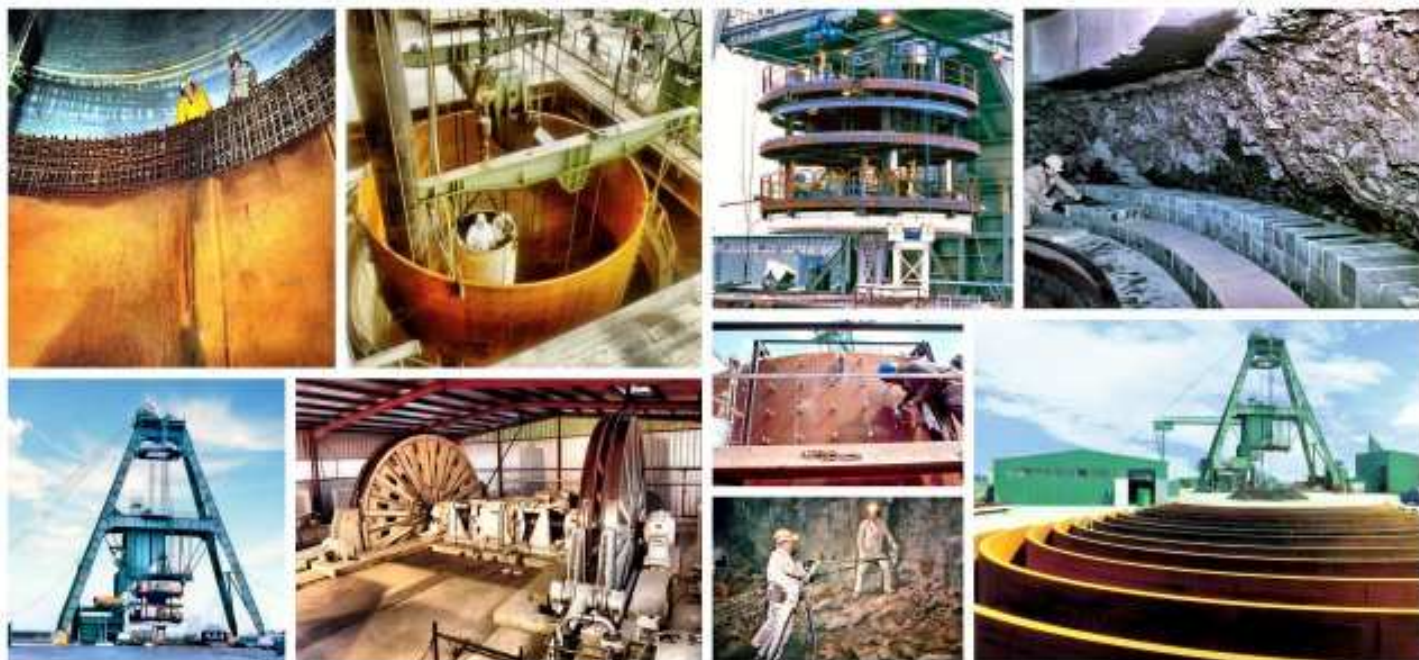


Shaft with great freezing depth, Rheinberg Shaft



Scope of Work

Design and construction of the freeze shaft

Client

Bergbau AG Niederrhein

Location

Duisburg, Germany

Geology

Instable, water-bearing sand, marl, layers of clay, Zechstein down to 610 m, below that Carbon

Duration

1986-1993

Technical Data

- Inner diameter: 7.5 m
- Depth: 1,270 m
- Freez pipe circle diameter: 22 m
- Freezing depth: 526 m
- Pre-shaft: caisson shaft down to 20 m
- Outer lining in the freeze shaft: yielding concrete block lining, thickness 0.30 m - 0.90 m
- Inner lining in the freeze shaft: asphalt joined layer (20 cm thick), composite lining consisting of outer water-tight welded steel sheet (18 mm thick), reinforced concrete (70 cm thick) and inner steel sheet (15 mm - 82 mm thick)
- Lining in solid rock: concrete cylinder with open ring joints
- Two insets at 885 m and 1200 m depth

Special Features

- Freezing technique down to 526 m depth
- Static co-bearing outer lining as concrete blocks
- Inner lining: steel / concrete / steel composite with asphalt backfill