

# Copenhagen District Heating Tunnel

**Copenhagen Energy A/S**



# Copenhagen Energy A/S



- Copenhagen Energy A/S is a leading energy and utility company owned by the municipality of Copenhagen
- We produce and distribute:
- District heating
- District cooling
- Town gas
- Water supply (Copenhagen plus 17 other municipalities)
- Sewage
- In near future we will introduce wind power
  
- We employ 700 people
- Annual turnover 4 billion dkk = 540 mill. Euro

# Status for district heating in Copenhagen

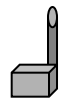
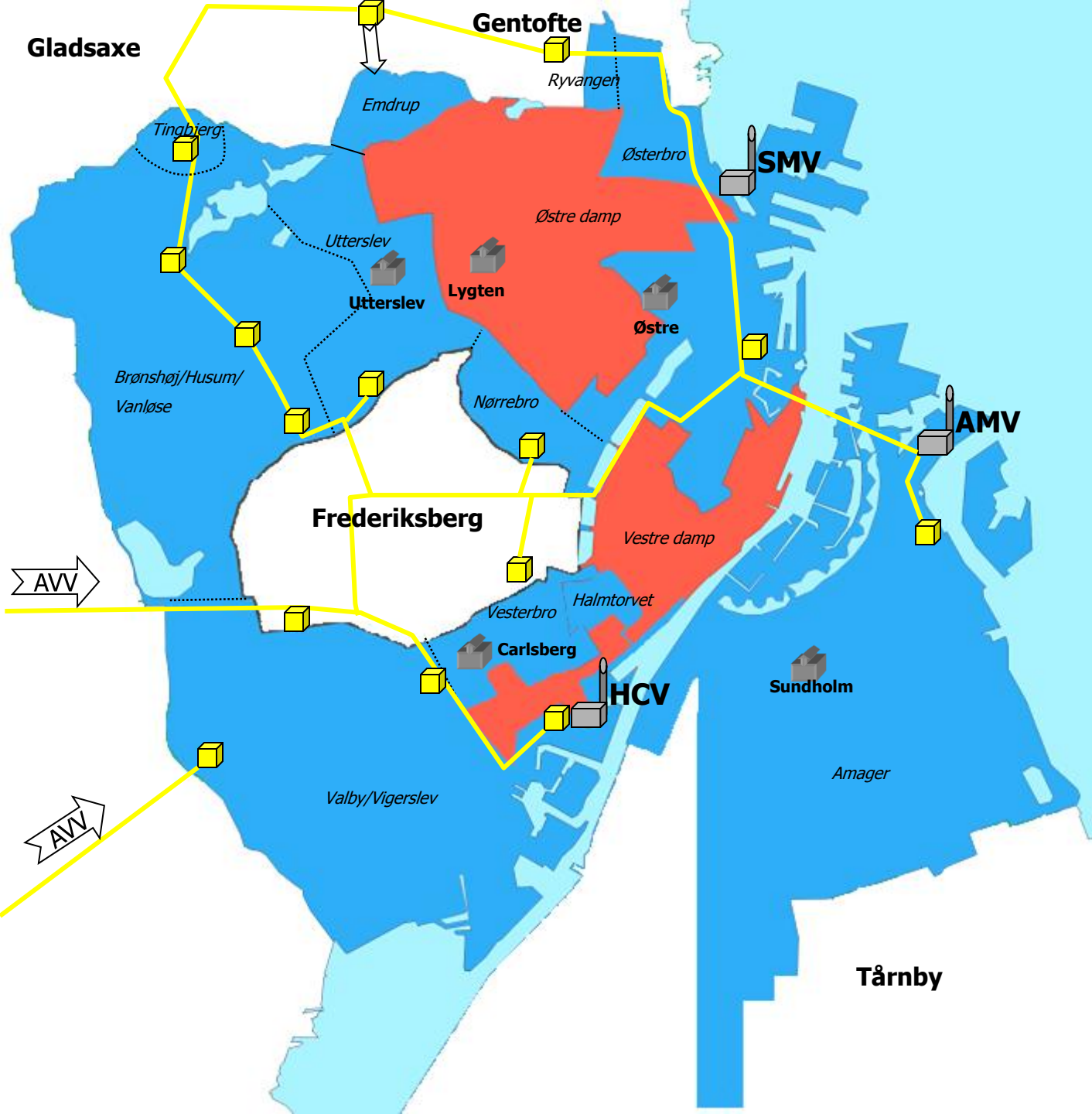
- Ca. 97% of Copenhagen municipality is supplied with district heating. 18.000 TJ/year.
- Number of customers: 1.500 steam based and 28.000 water based.
- Length of network 1.350 km, hereof 60 km steam based.
- Annual sale 2,4 billion dkk = 323 mill. Euro. 30% steam based.

Gladsaxe

Gentofte

# Københavns Fjernvarmeforsyning

## Produktion og transmission



Kraftvarmeverk/  
Affaldsforbrænding



Spidslastcentral



Vekslerstation



Transmissionsledning



Varmt vand



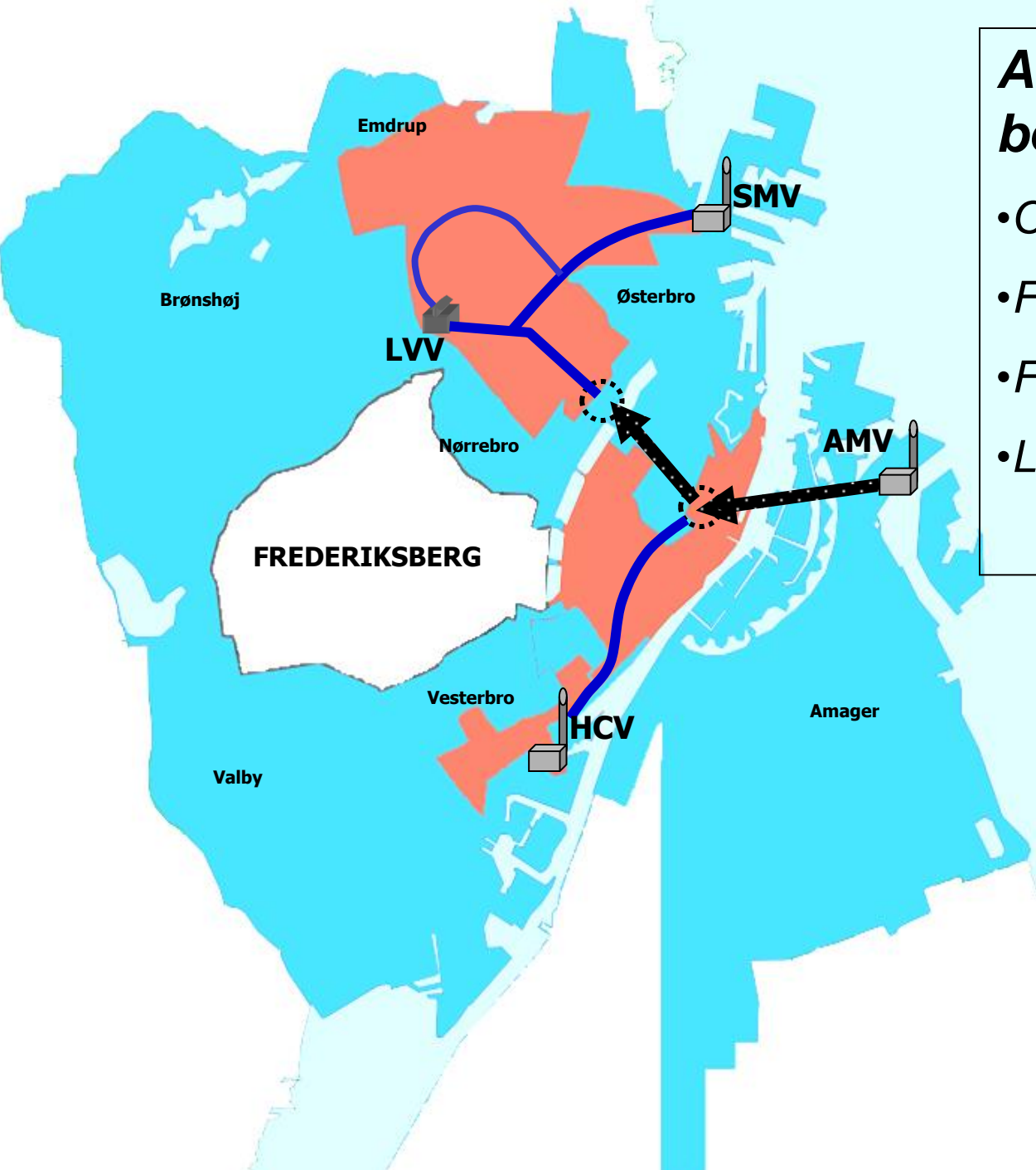
Damp

# CO2 neutrality by 2025

- Municipality of Copenhagen aims to become CO2 neutral by 2025
- Important steps to achieve this:
  - Biofuel on powerplants
  - Conversion of steambased heating net
  - Windpower

# ***AMV and tunnel benefits***

- *Cheaper heating*
- *Future supply structure*
- *Flexible conversion*
- *Lower CO2 emmissions*



- Hot water
- Steam
- Future Water pipes

# New heating tunnel under Copenhagen

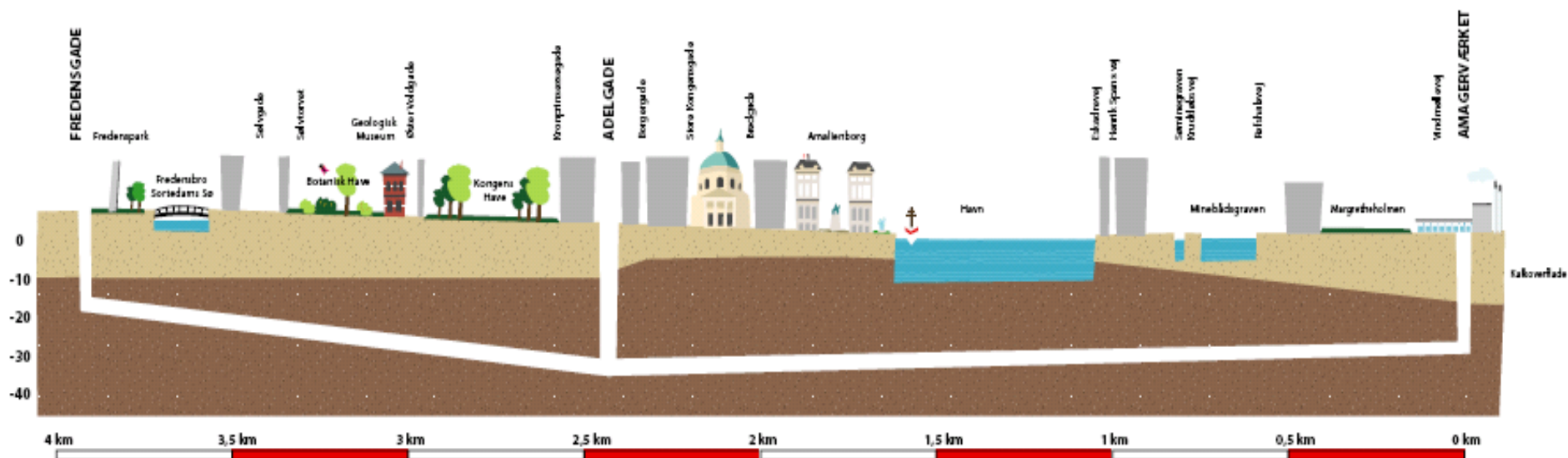
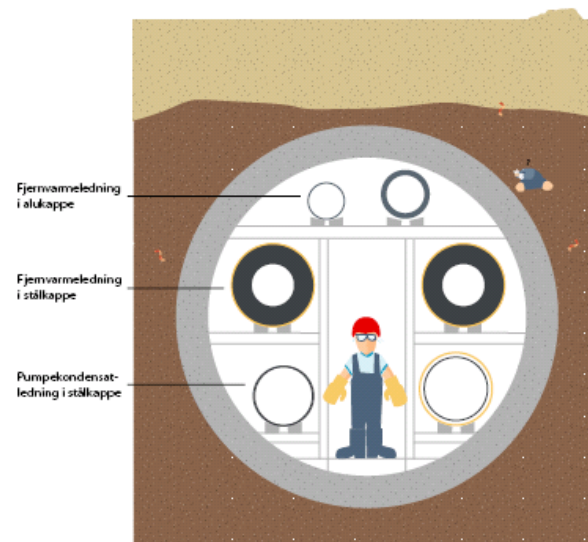
**Budget: 100 million Euro (2004)**

**Length: 4 km Diameter: 4,2 m**

**3 access shafts – depth: 25-40m**

**Project completed in 2009**

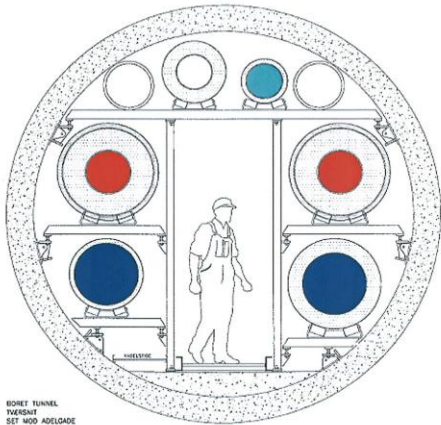
**Final cost 120 million Euro (2009)**



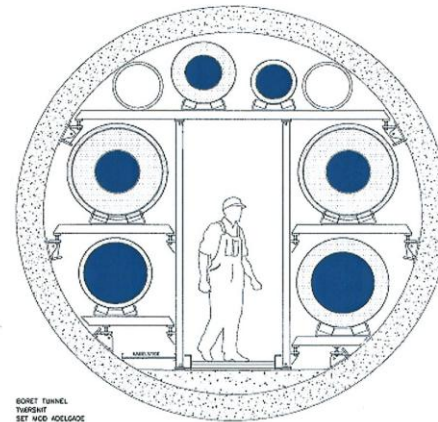
# TUNNELSOLUTION GIVES FLEXIBILITY

Steam supply must be maintained during conversion from steam to hot water. After conversion steam and condensation pipes can carry hot water.

Before and during conversion.



After conversion.





# Tenders

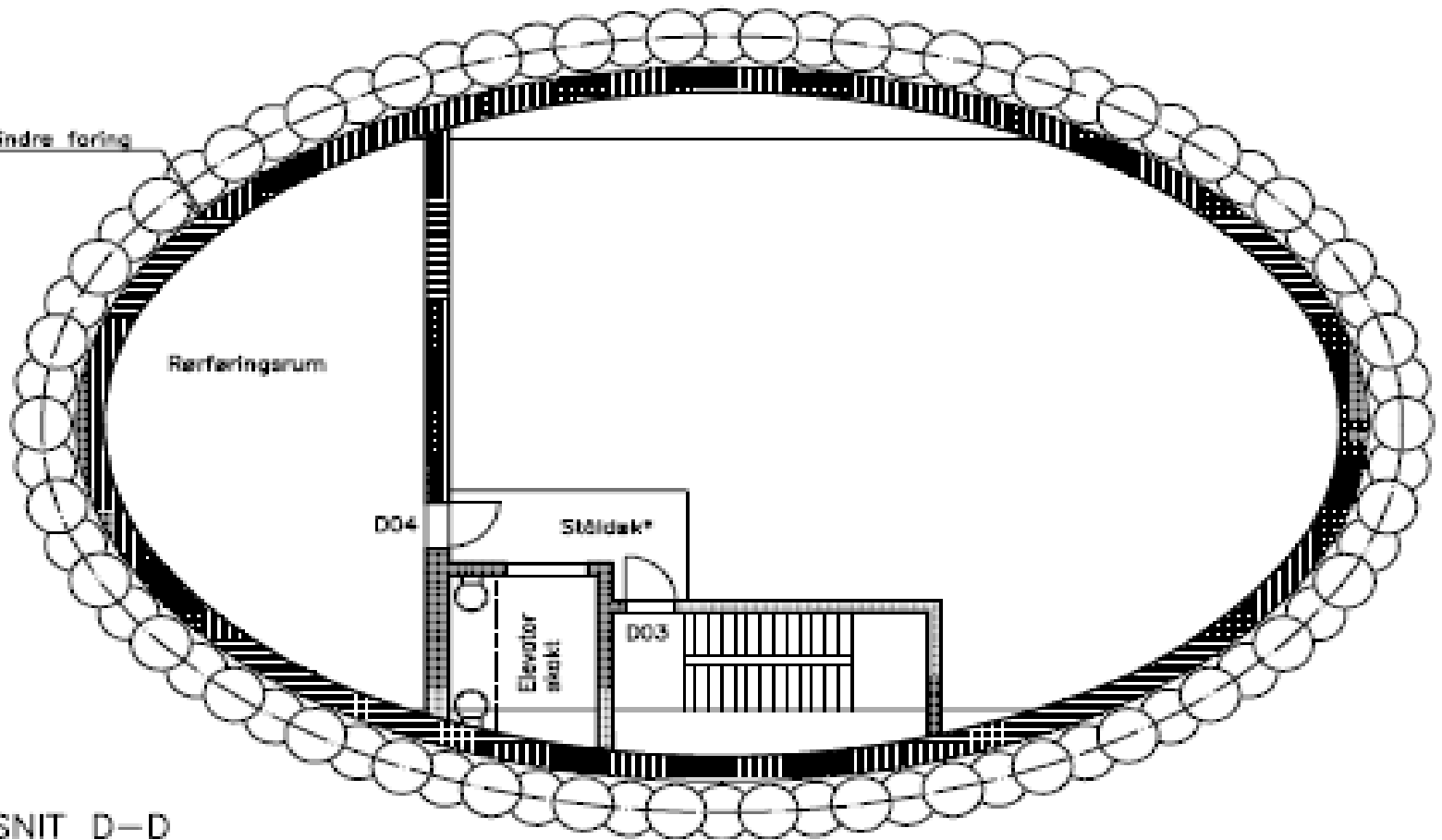
- Consultant (COWI)
- Tunnelconstruction (KFT-JV)
- Piping and installations. (KLR)
- Steel in steel pipe system (FW)
- Valves, pumps og kompensators (CE)

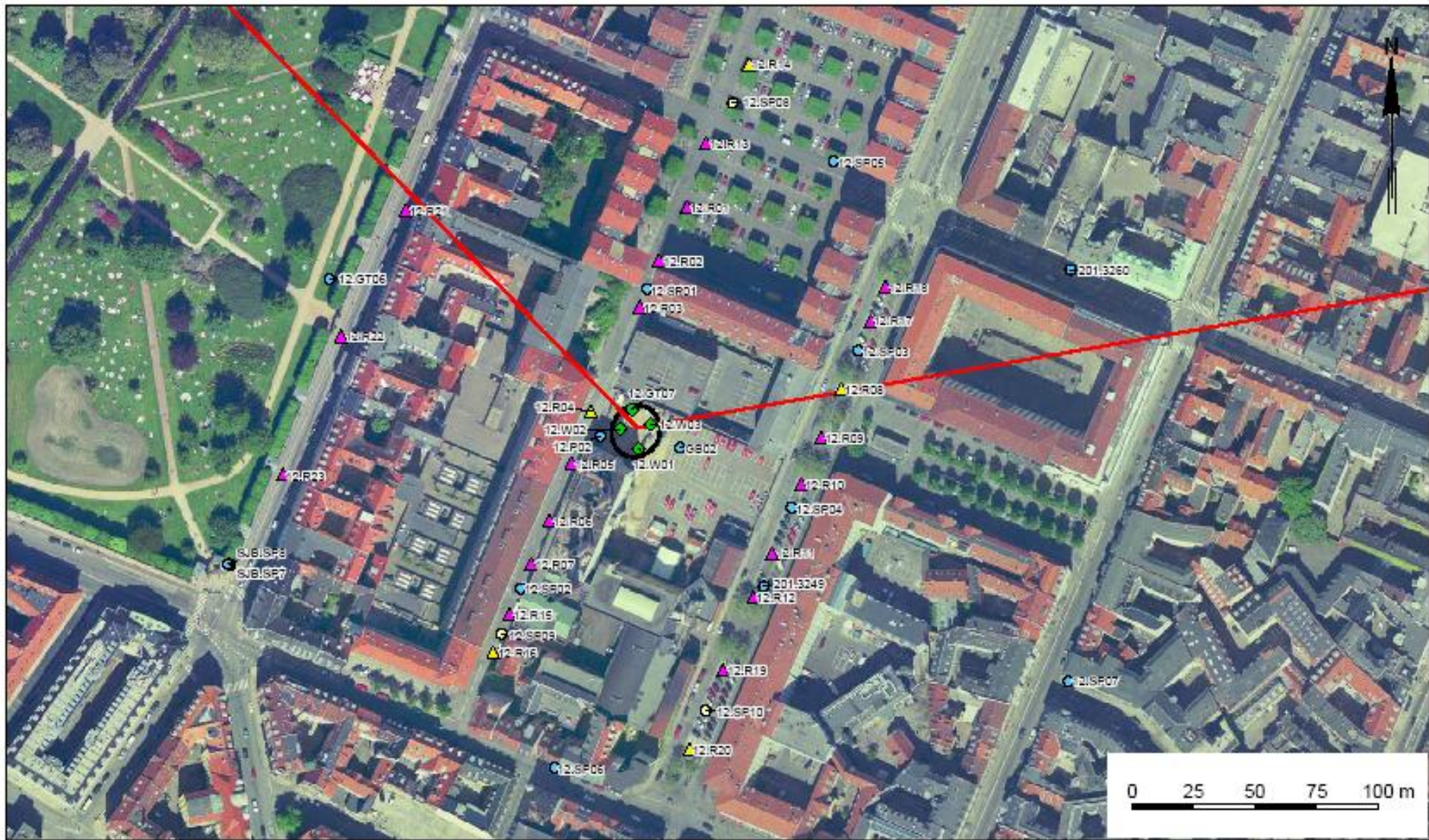
# Partnering agreement

- Common detailed design – to make use of contractors experience
- Open economy
- Bonus agreement
- Conflict handling. Mediator
- Safety bonus



550 mm indre foring





Boringer til grundvandshåndtering

◆ Pumpeboringer

● Pejleboringer

▲ Infiltrationsboringer

Beredskabsboringer

□ Pejleboringer

▲ Infiltrationsboringer

Kædetankens Egevej  
Varnø  
Fjernvarmehuset

Beliggenhed af boringer ved Adelgade Skakt

**COVI**

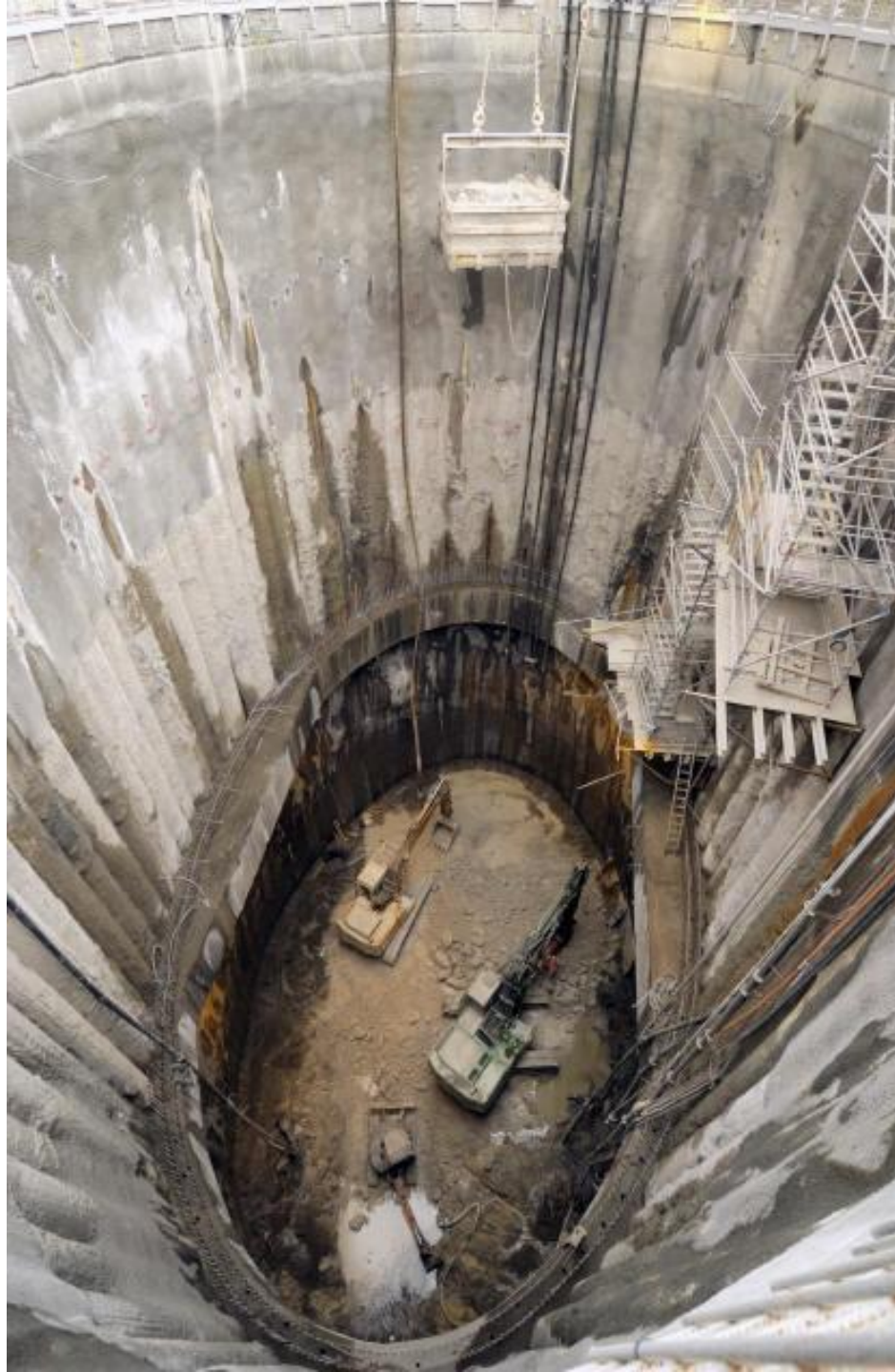
COVI A/S  
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2650 Lyngby

Telefon: +45 44 55 11 11  
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Proj. nr.	P-55528-A
Sign./Tegn.	HBE
Kont.	LE
Skala	LE
Størrelse	1:2000 (1/A4)
Dato	14-12-2005
Dokument nr.	



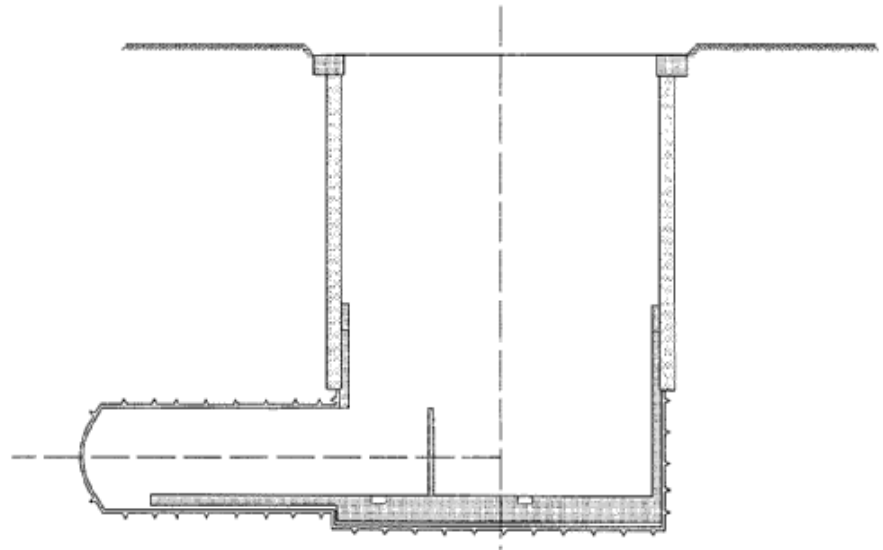






# NATM tunnel excavation

## Bottomplate



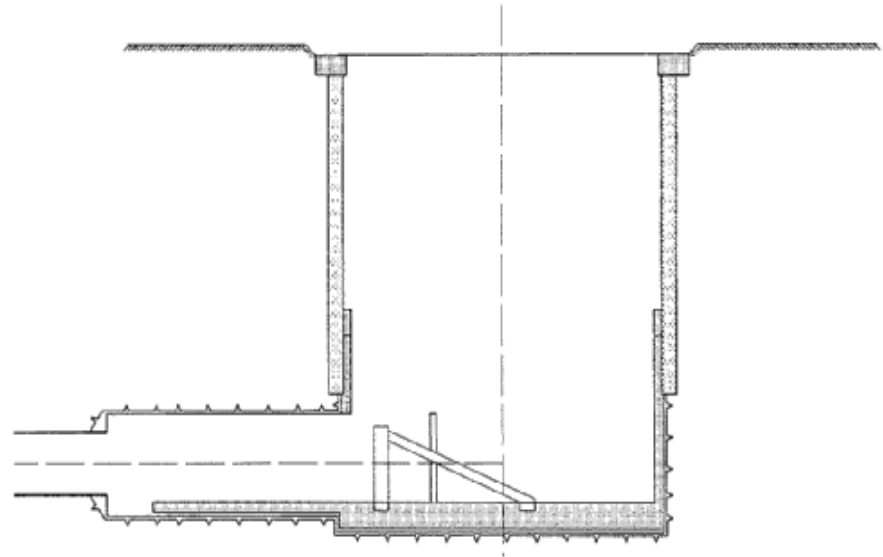




**TBM start in AMV  
shaft and NATM tunnel**

**Turning of TBM in  
ADG shaft**

**Dismantling of TBM in  
FRG shaft**





Asitid

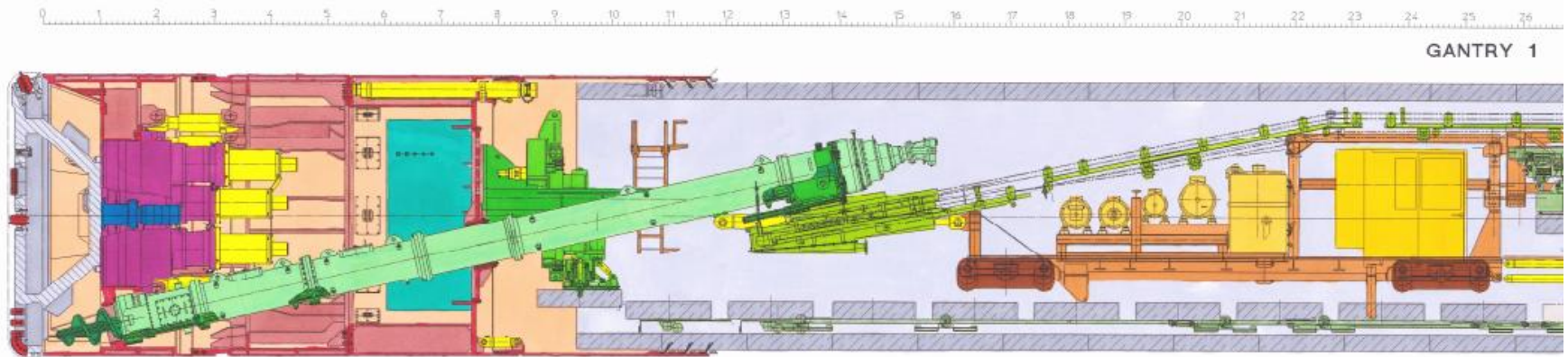
HOCHTIEF COVET  
Klostermann Eisenwerke Turin

KFT-JV

HOCHTIEF



# Tunnel Boring Machine – Herrenknecht 5,1 m TBM - EPB type

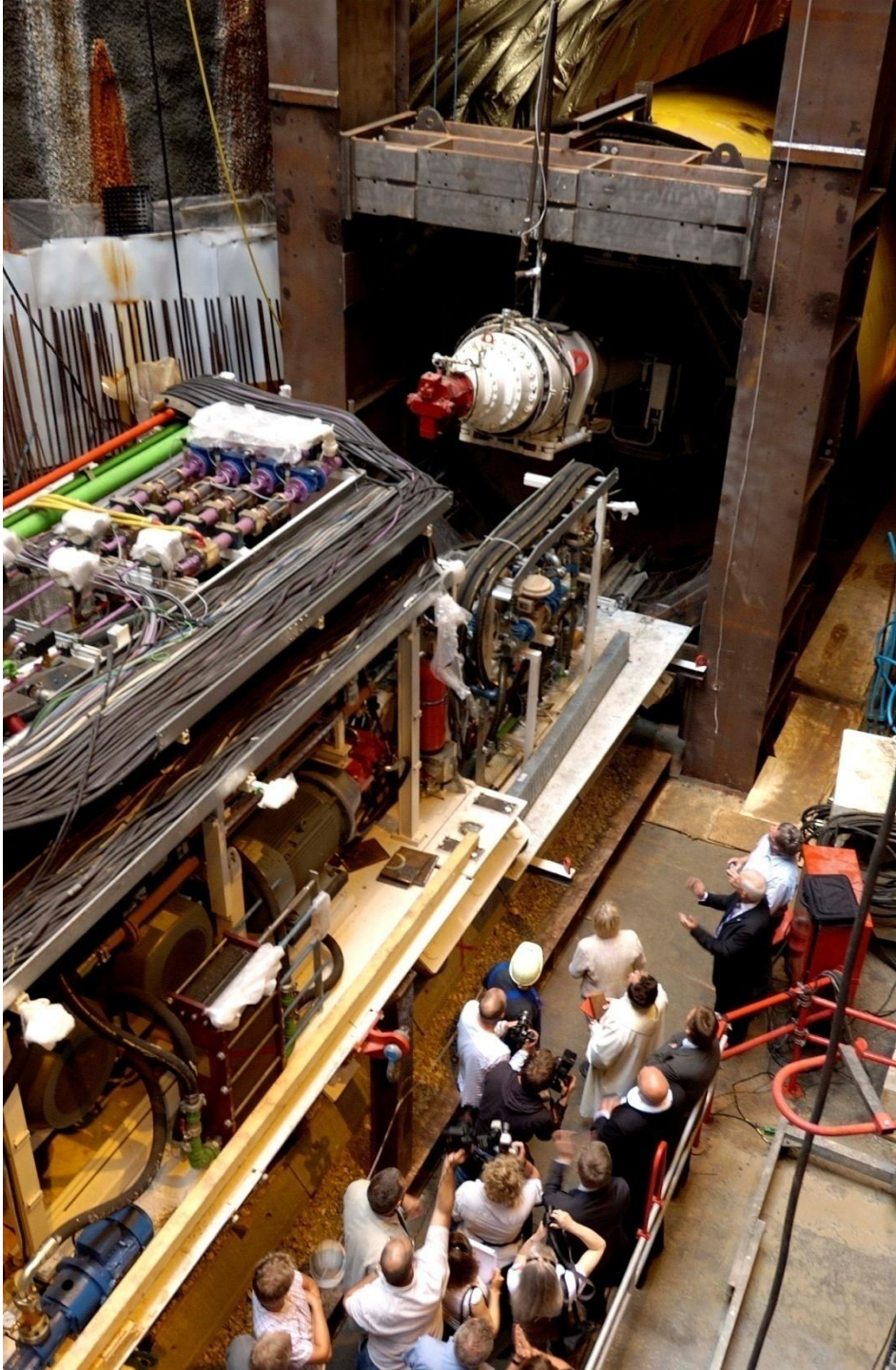


- Length of shield: 12 m
- Total length: 128 m
- Weight of cutter head: 70 ton
- Total weight of TBM: 500 ton
- Effect on cutter head: 1500 kW
- Max. boring speed: 80 mm/min
- Penetration rate: 12 mm/r
- Max pressure: 4,5 bar
- Min radius in curves: 300 m



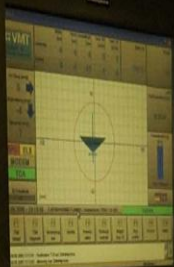














# Breakthrough in Adelgade

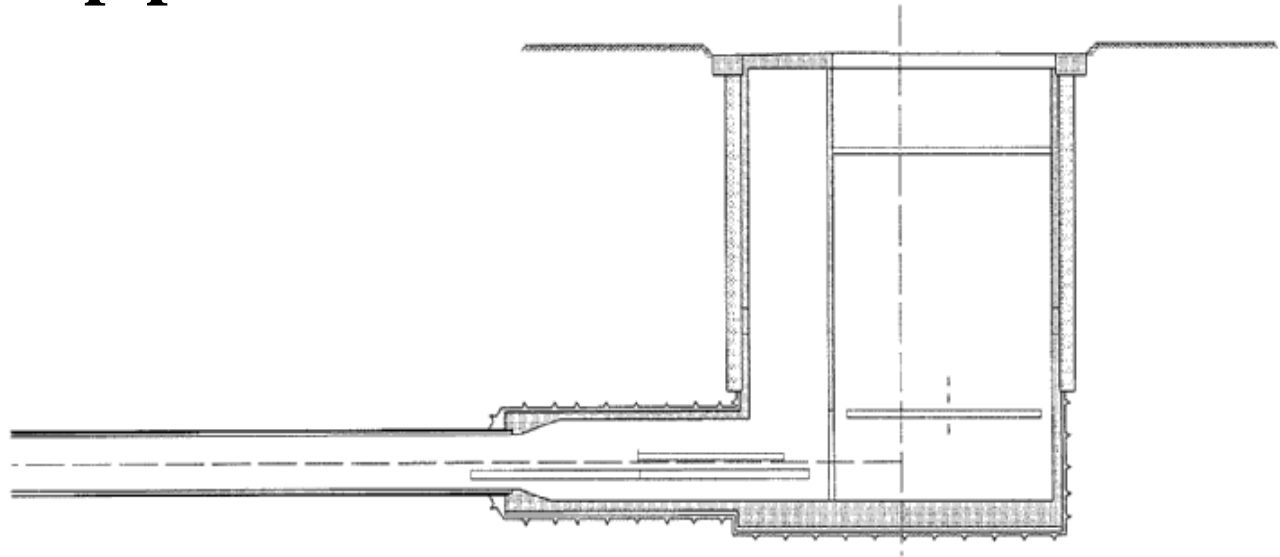




**Inner lining with  
membrane in skaft and  
og NATM tunnel**

**Installation of pipes  
tunnel**

**Topplate**















FORGE  
TECHNOLOGY

**Inner walls, stairs and  
elevator**

**Pipe installation in shaft**

