Refurbishment of the Copenhagen Transmission Grid

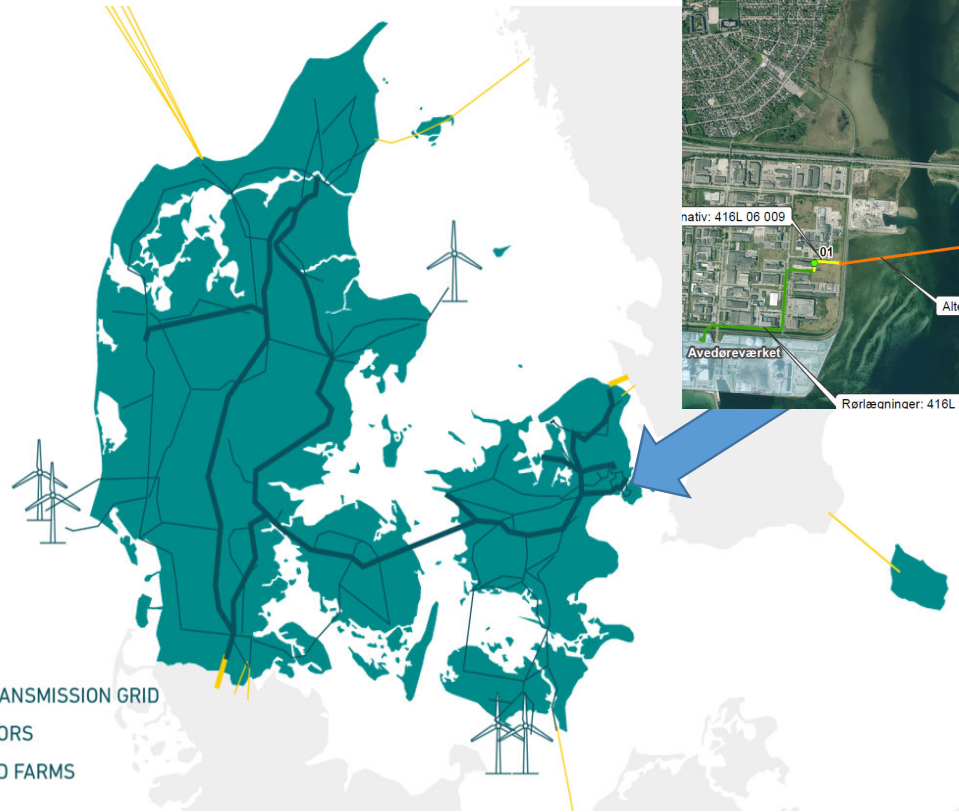
Daniel Johan BRØNDUM; Energinet Transmission, Denmark
Rasmus **OLSEN**; Ørsted Wind Power, Denmark
Willem **GRIFFIOEN**; Plumettaz, Netherlands
Kim Høgh **THOMSEN**; NCC, Denmark
Gerolf **STADIE**; Nexans High Voltage, Germany

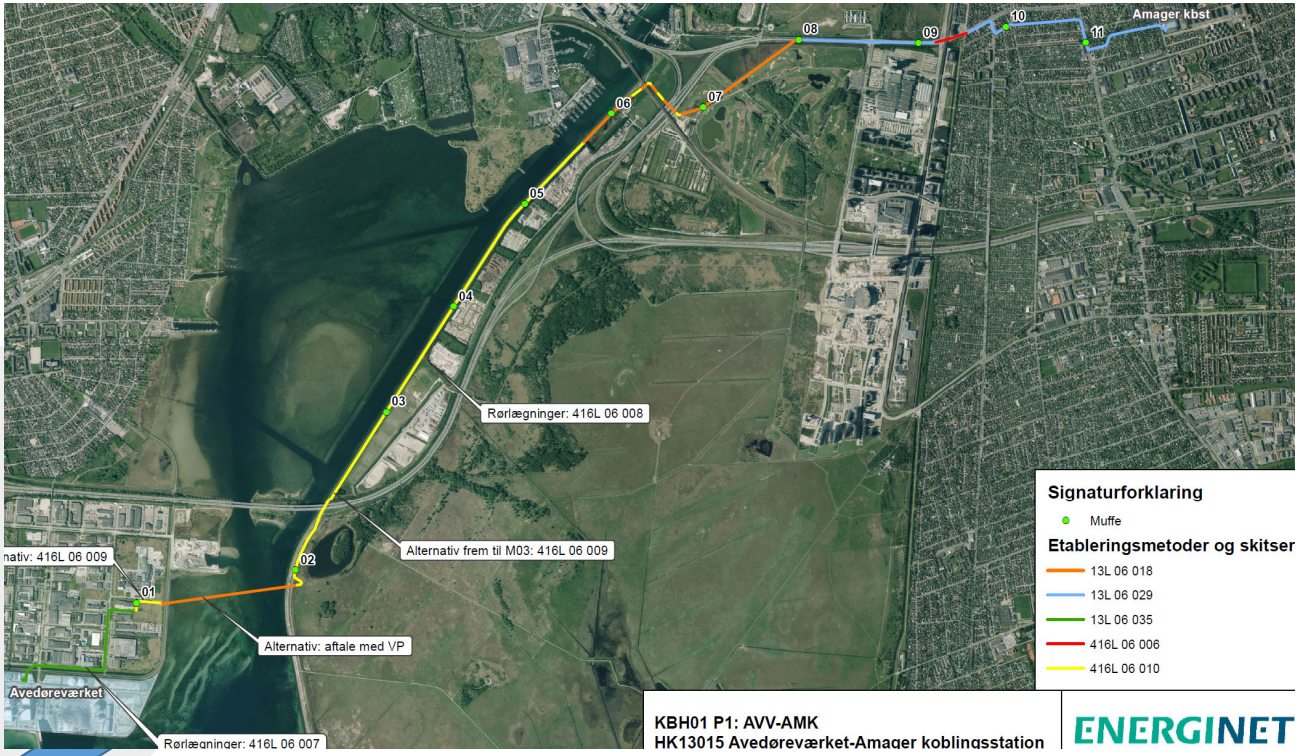
10th International Conference on Insulated Power Cables

Refurbishment of the Copenhagen Transmission Grid

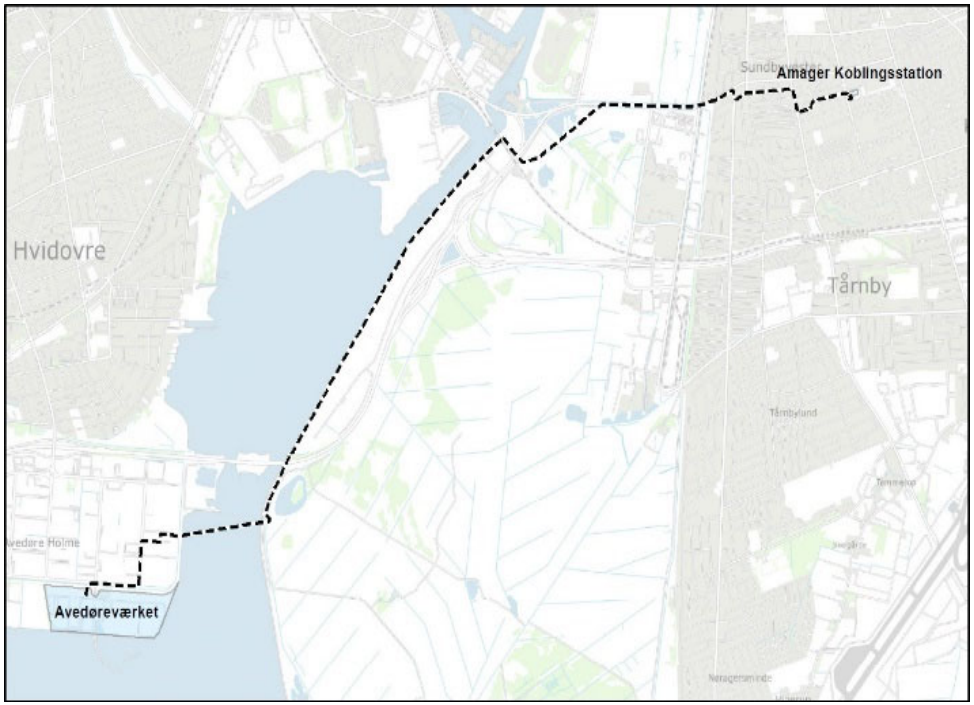
Project Planning and Execution

INTRODUCTION TO THE PROJECT





Electrical Requirements and conditions



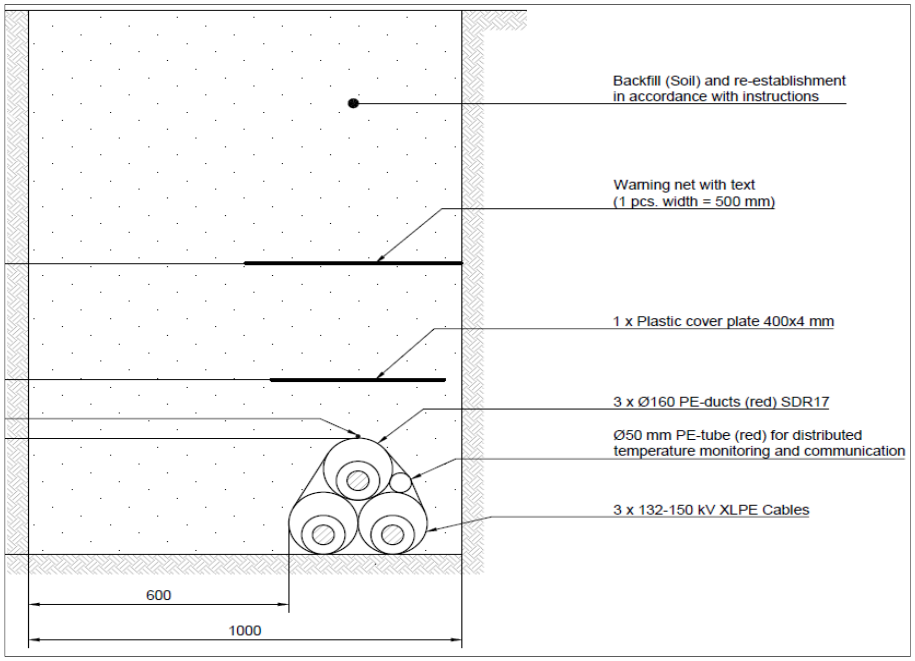
Electrical parameters

- System voltage 132 kV
- Continuous current up to 1200 A
- Yearly average current up to 400 A
- Short circuit rating of 40 kA for 0.5 seconds

Installation parameters

- Industrial areas
- Crossing the River
- Crossing two highways and a Railway
- Golf cource
- Installing cables in a larger main road into Copenhagen
- Crossing a metroline
- Urban areas

Electrical Requirements and conditions



- Cables installed in directly buried ducts, where possible the cables would be installed themselves directly, without ducts.
- Thermal resistivity of 2.0 Km/W
- Ambient temperature of 20 ^{o}C
- Maximum cable conductor temperature of 90 ^{o}C
- Installation depth of 1.4 meters to bottom of trench, where possible
- In trefoil - to limit the magnetic field above ground

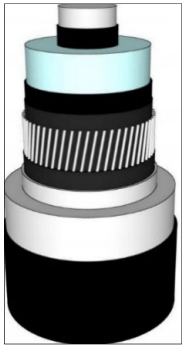
Cable System Design

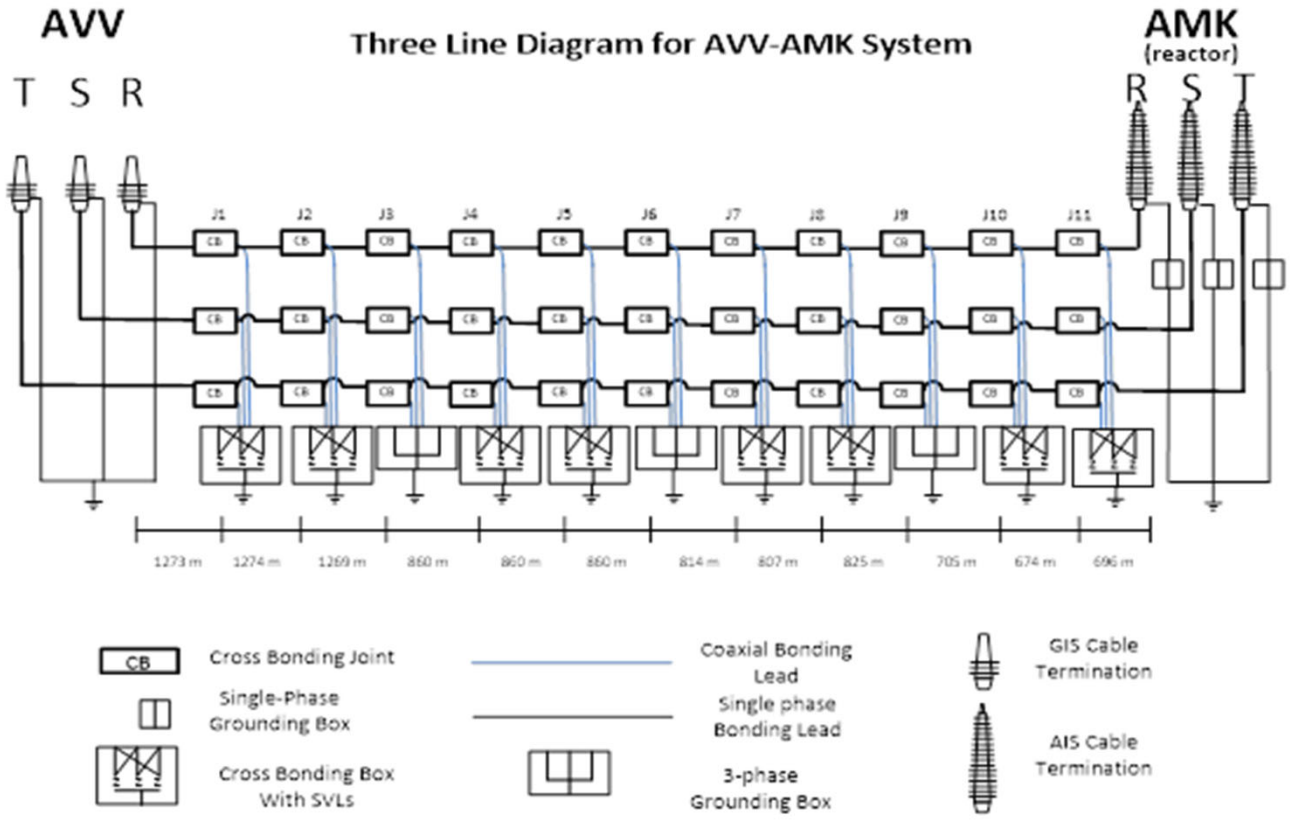
10.7km of cable route

Cable parameters

145kV 2000mm2 Aluminium round solid XLPE

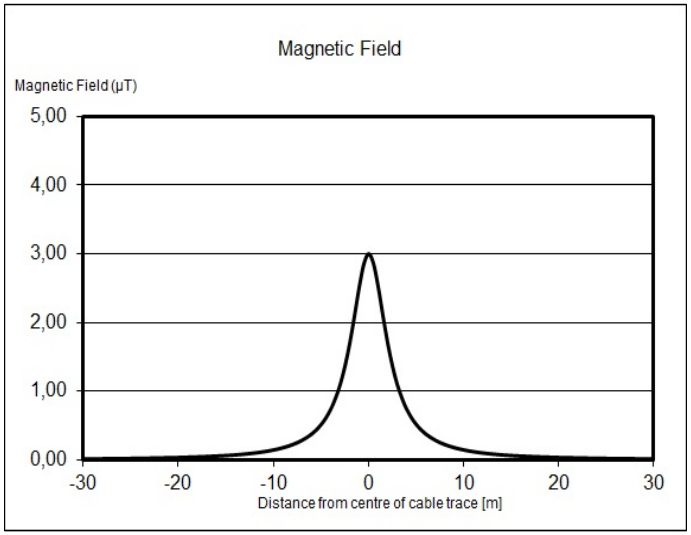
Aluminium wire screen





Magnetic Field

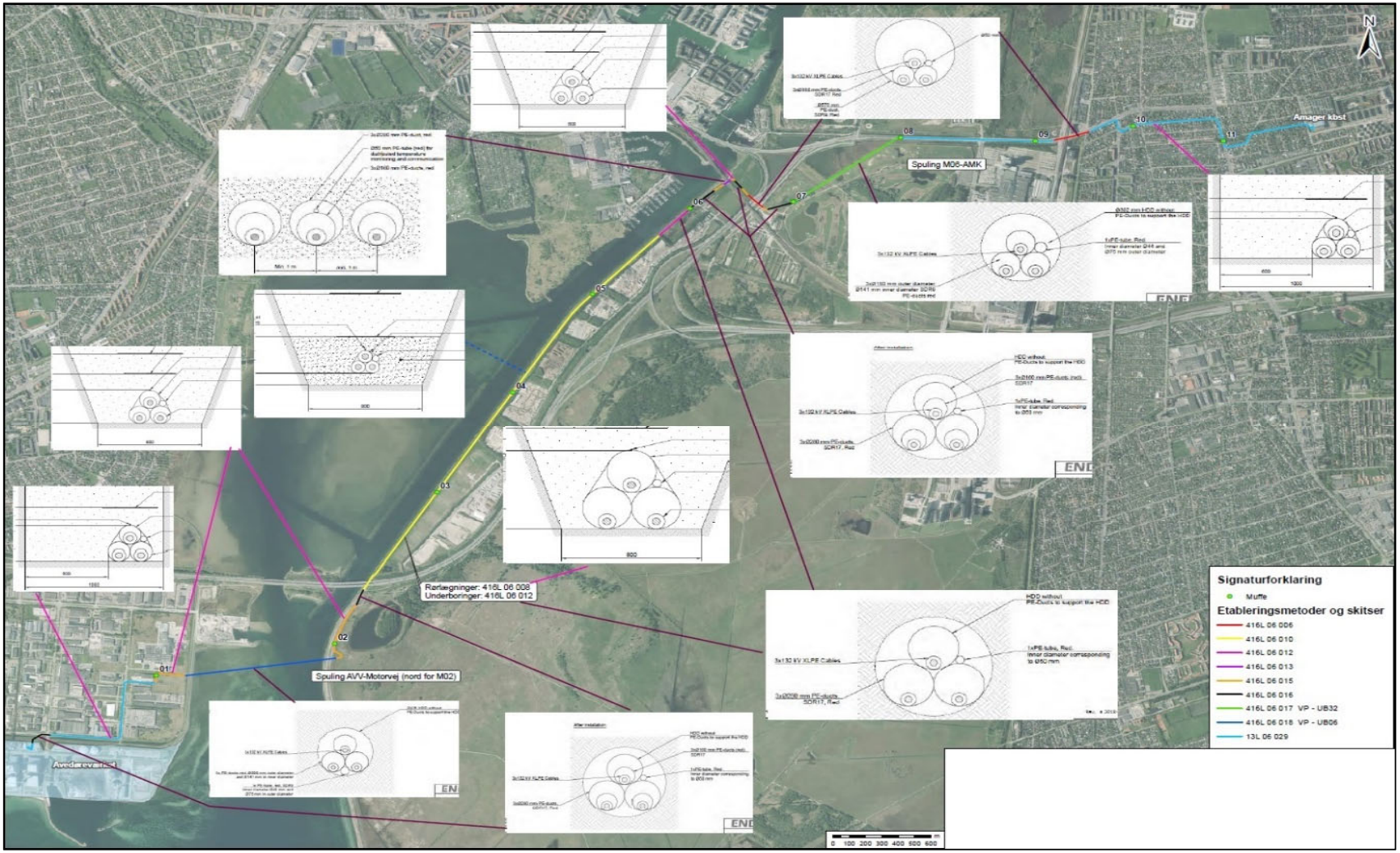
The magnetic field kept lower than 0.4 µT in people's houses, in schools, in child day-cares, etc., measured in a height of 1.0 meter above ground.



6.0 meters away from the cable route the magnetic field has fallen to 0.4 µT. Therefore houses, schools, etc. should be located not closer than 6.0 meters from the centre of the cable route.

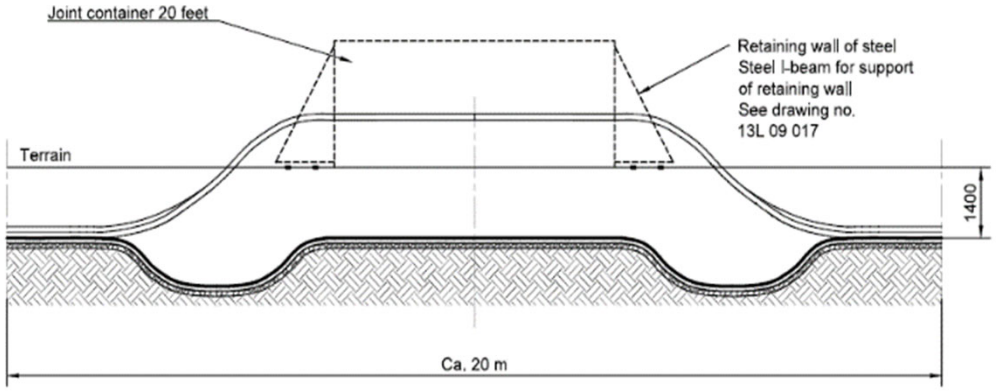
In several cases other distribution lines where move and reconnected in order to for fill this requirement.

Installation conditions



Installation methode

Flexible installation with pipes and joint Bays.
Install one section when ready.



Horizontal Directional Drilling in UXO area

Protection shilding during work.
Night work.

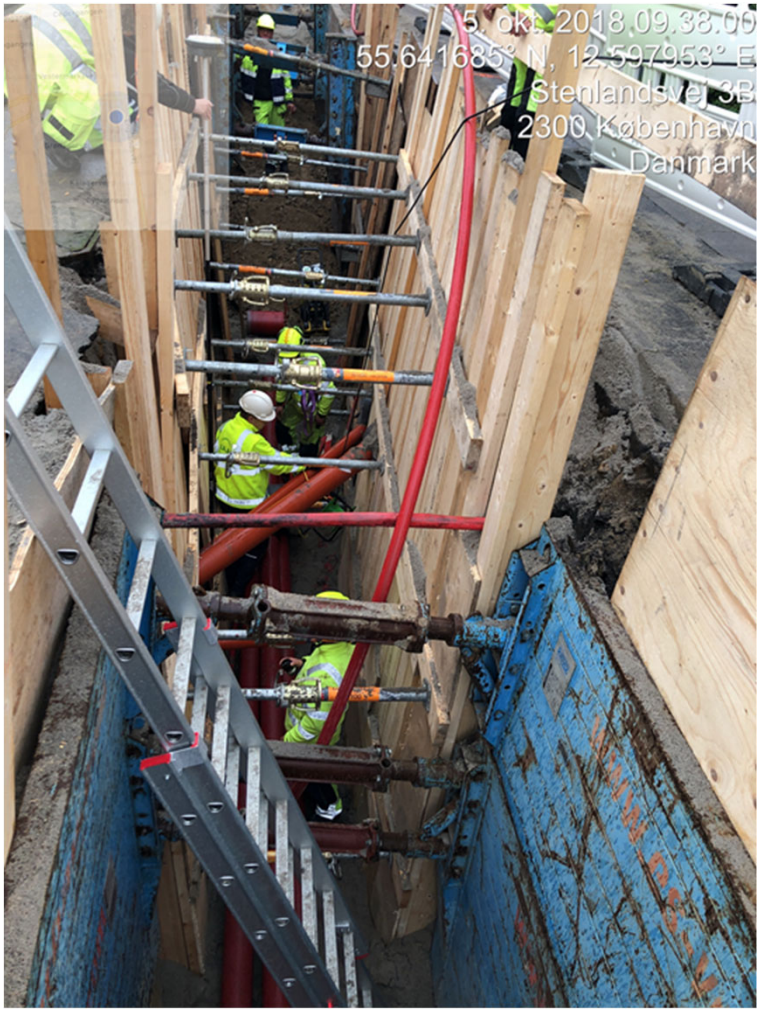
Old military grante in the middel of the road

CHALLENGES

Digging permit.
Working in the road.
Local Authorities.

CHALLENGES

Crossing other different distribution lines.
Find the free space underground.
Trace deeper then 4meters.



CHALLENGES

CONCLUSION

- Proper planning and proaktive management together with the involved contractors and permit autorities.
- What are in the under ground?
- Solid cable and cable system design.
- Fleksible installation of cable sections.
- Pragmatic approach to problem solving in the field.