

Velkommen / Welcome

Copenhagen 2. October 2008 - 25th Anniversary

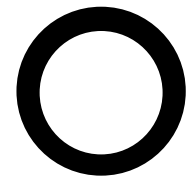
Dansk Forening for Tunnel - og Undergrundsarbejder

1983 til 2008

Danish Society for Tunnels and Underground Works

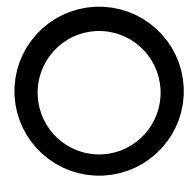
1983 to 2008





- The Danish Tunnel Society was "born" 12th September 1983
- The initiative to establish the Society was mostly related to:
 - Vejdirektoratet / Danish Road Directorate &
 - DSB / Danish State Railways
- The objectives:
 - Networking among Danish Engineers
 - International Tunnel Association (ITA)
 - Promote tunnel industri in general
 - Knowledge sharing by organising
 - Excursions to Construction Sites
 - Meetings and Seminars with presentations of tunnel and underground projects under planning, design and construction





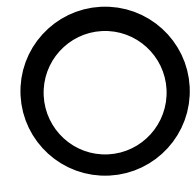
- The Society has been chaired by
 - Preben Avnstrøm, DSB/Danish State Railways
1983 - 1987
 - Hans Henrik Gotfredsen, Vejdirektoratet/Great Belt Link
1987 - 1993
 - Ole Steen Christensen, MT Højgaard
1993 - 1999
 - Anders Odgaard, COWI/Metroselskabet
1999 - 2005
 - Jørgen Holst, COWI
2005 -



DFTU 1983 - 2008, Tunnelling during 25 years

Guldborgsundtunnelen 1984 - 1988

ITA/AITES



Immersed Tunnel with 2 tubes and 4 lanes

Length ~ 1200 m

Contractor: PIHL and Armtton

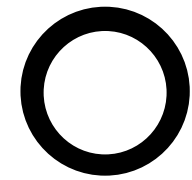
Designer: Christiani & Nielsen



DFTU 1983 - 2008, Tunnelling during 25 years

Great Belt East Tunnel 1988/1998

ITA/AITES



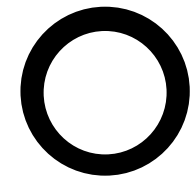
- East Tunnel, length 8.024 m
- Two tubes carrying 1 rail in each, 31 Cross-over Tunnels
- Deapest point ~ approx. 75 m below normal sea level
- 4 TBM were in action
- Contractor: Monberg & Thorsen (MT Hojgaard)



DFTU 1983 - 2008, Tunnelling during 25 years

Great Belt East Tunnel 1988/1998

ITA/AITES



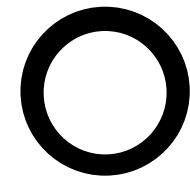
© 2003 Christian Cederberg



DFTU 1983 - 2008, Tunnelling during 25 years

Sydhavnsgadetunnelen 1993 - 1997

ITA/AITES



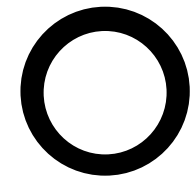
- Cut and Cover Tunnel
- Length ~ 1600 m
- 1 tube carrying 2 rails
- 10 - 15 m below ground level
- Contractor: NPL/SIAB
- Design: Grontmij | Carl Bro



DFTU 1983 - 2008, Tunnelling during 25 years

Tårnbytunnelen 1994 - 1998

ITA/AITES



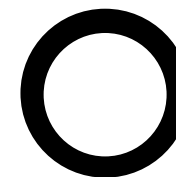
- Cut and Cover Tunnel, Combined Road and Rail Tunnel
- Length ~ 700 m
- 4 tubes carrying 2 rails and 4 lanes
- Includes Tårnby Railway Station
- Part of Øresund Link
- Design: Grontmij | Carl Bro



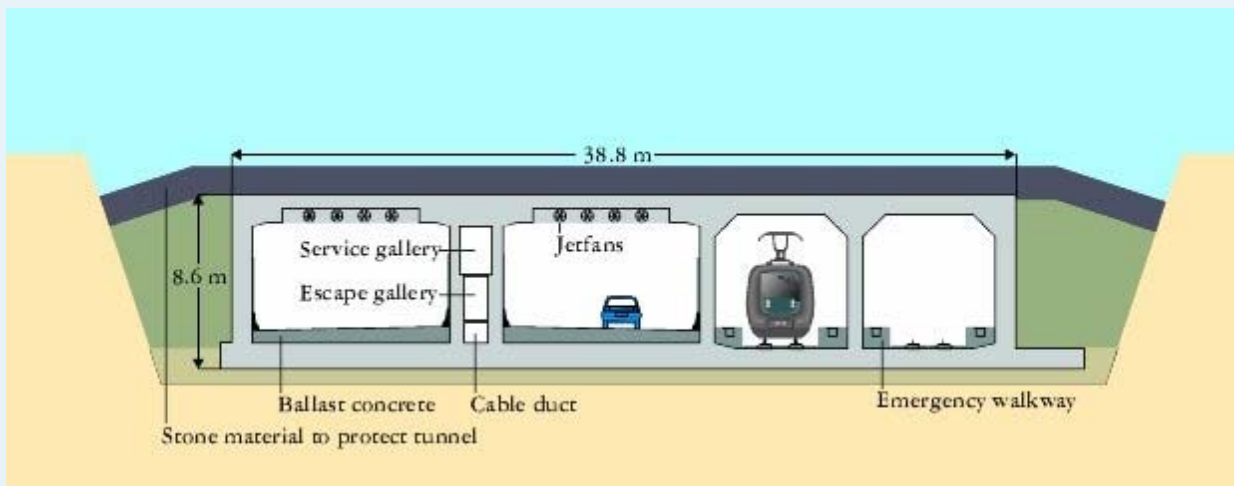
DFTU 1983 - 2008, Tunnelling during 25 years

Øresundstunnelen 1994 - 2000

ITA/AITES



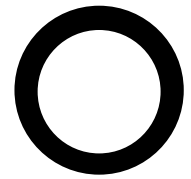
- Immersed Tunnel, Combined Road and Rail Tunnel + Service Gallery
- Length ~ 4.050 m including portals
- 20 Tunnel Elements
- 4 tubes carrying 2 rails and 4 lanes
- Contractors: Øresund Tunnel Contractors (NCC, PIHL +)



DFTU 1983 - 2008, Tunnelling during 25 years

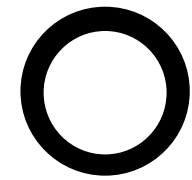
Øresundstunnelen 1994 - 2000

ITA/AITES

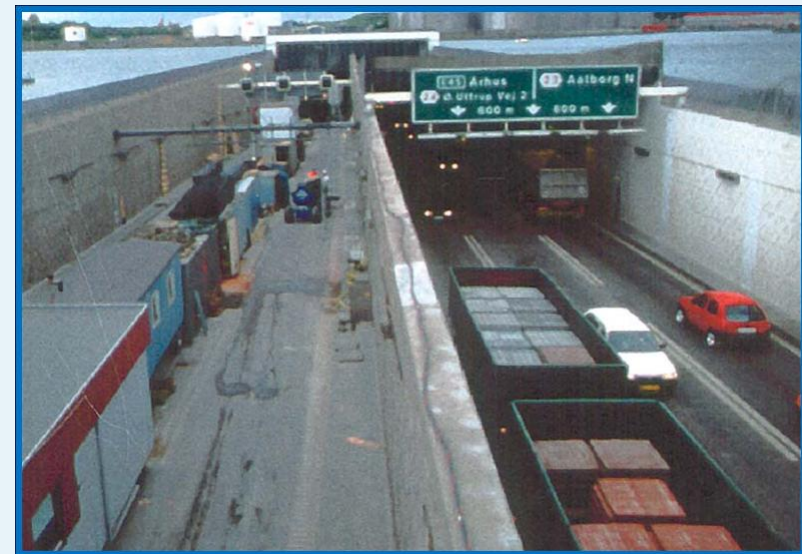
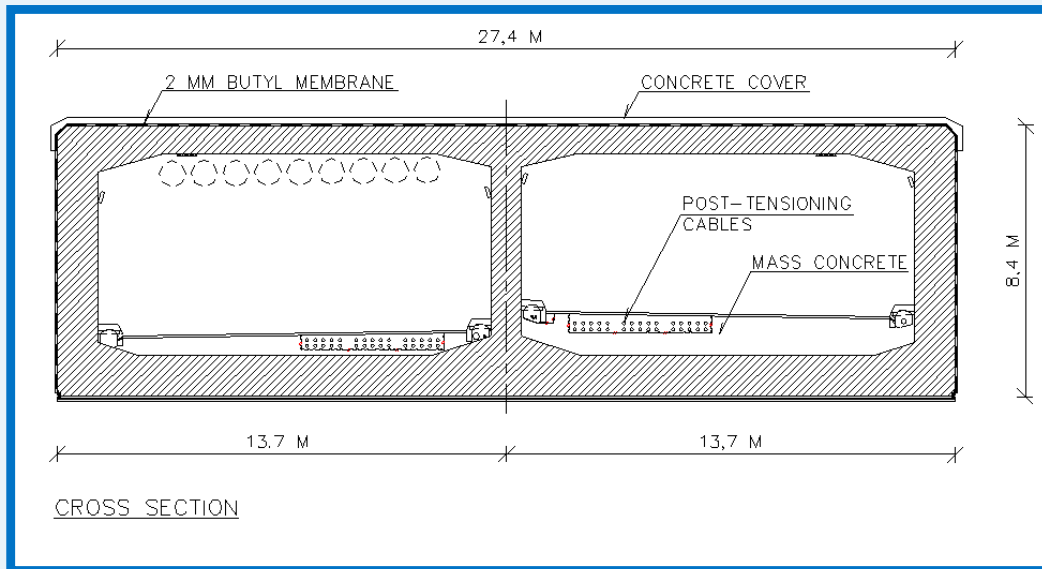


DFTU 1983 - 2008, Tunnelling during 25 years Limfjordstunnelen 1993 - 2001, Main Rehab.

ITA/AITES

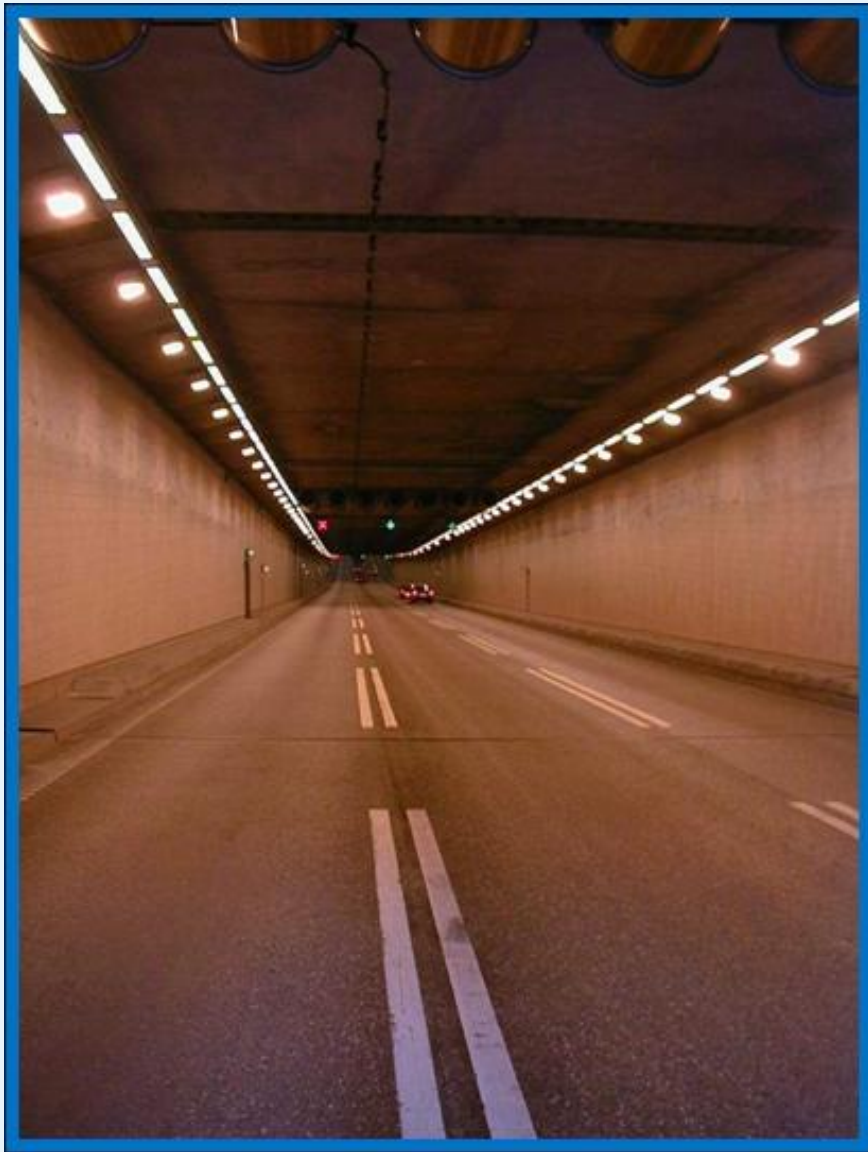
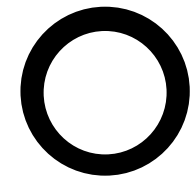


- Immersed Road Tunnel, 2 tubes, 3 lanes each
- Opened in 1969 - Aalborg
- Length ~ 945 m
- Post-tensioning of tunnel structure
- Renewal of M&E + ITS systems
- Repair Costs: 200 mio. DKr. (Priceindex 1997)



DFTU 1983 - 2008, Tunnelling during 25 years Limfjordstunnelen 1993 - 2001, Main Rehab.

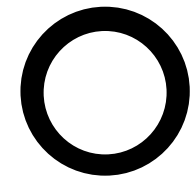
ITA/AITES



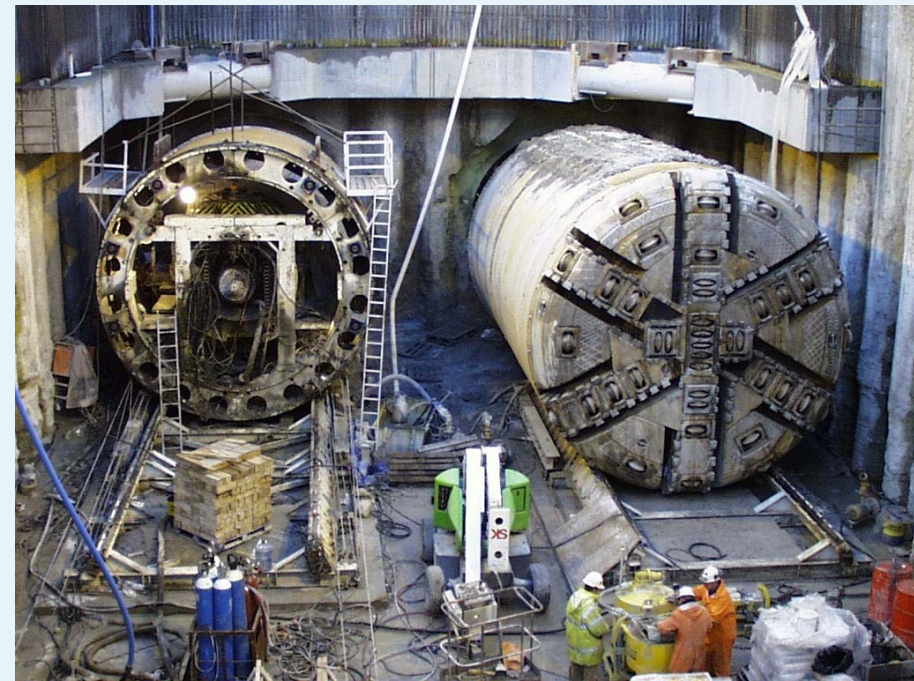
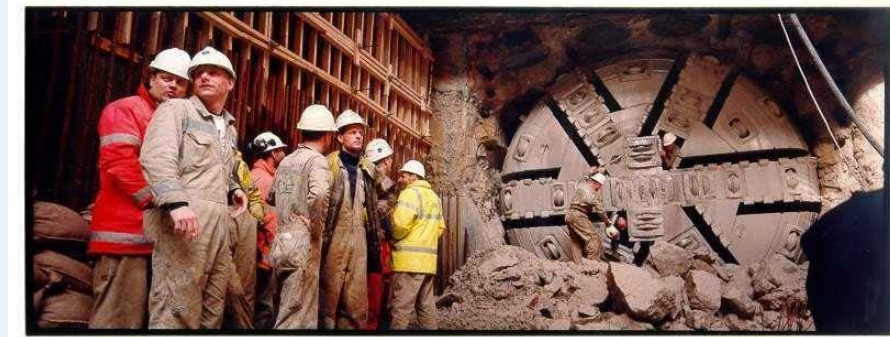
DFTU 1983 - 2008, Tunnelling during 25 years

Copenhagen Metro 1993 - 2007

ITA/AITES



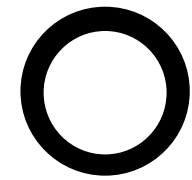
- Ørestadsselskabet / Metroselskabet I/S
- Phase I opened October 2002
- Phase II a + II b / May and October 2003
- Phase III opened in September 2007 (Kastrup)
- TBM & NATM Methods
- 21 km in total, 10 km underground metro including 9 underground stations



DFTU 1983 - 2008, Tunnelling during 25 years

District Heating Tunnel 2005 - 2009

ITA/AITES

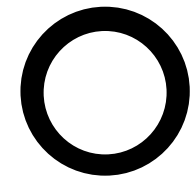


- Client: Københavns Energi
- Contractor: MT Højgaard (DK) + Hochtief Construction (D)
- Consultants: COWI
- Contract form: Partnering
- Length ~ 3,9 km, D = 5.1 m, EPB shield TBM
- Level ~ 35 to 40 m in Copenhagen Limestone
- Tunnel break - through in April 2007



DFTU 1983 - 2008, Tunnelling during 25 years Other Underground Works completed

ITA/AITES

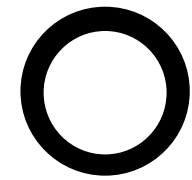


- New Opera House "Operaen", Copenhagen Harbour Front
- New Royal Theater "Nye Skuespilhus", Copenhagen Harbour Front
- Automated Underground Parking facilities, Copenhagen City Center
- "Forsinkelsesbassin" på Sct. Annæ Plads (MT Højgaard)
- CTR tunneling (naturgas project in 1980's)
- NCC tunneling, Faroe Islands
- And many many more projects

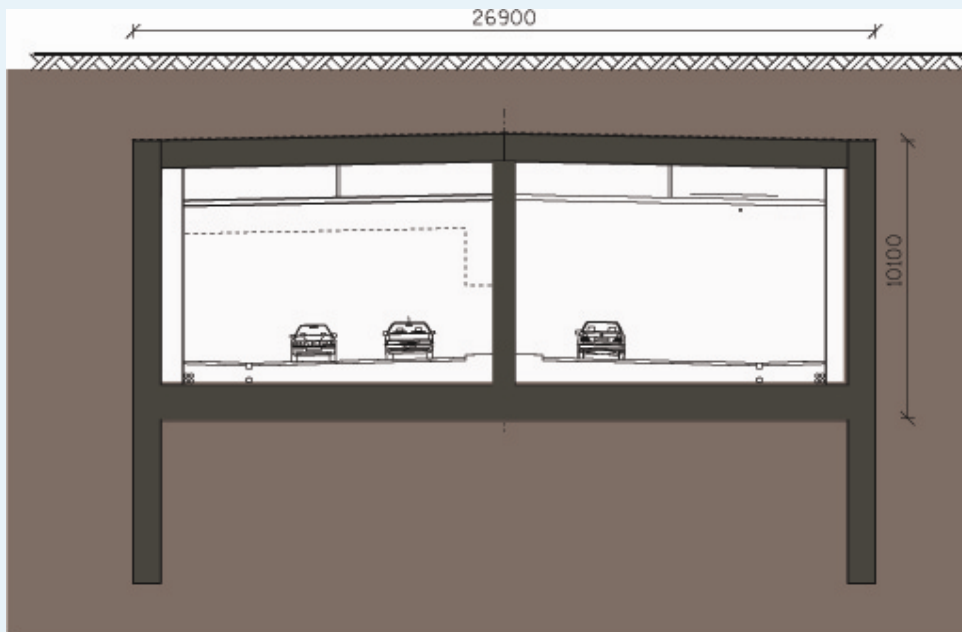


DFTU 1983 - 2008, Tunnelling for the Future Potential Tunnel Projects

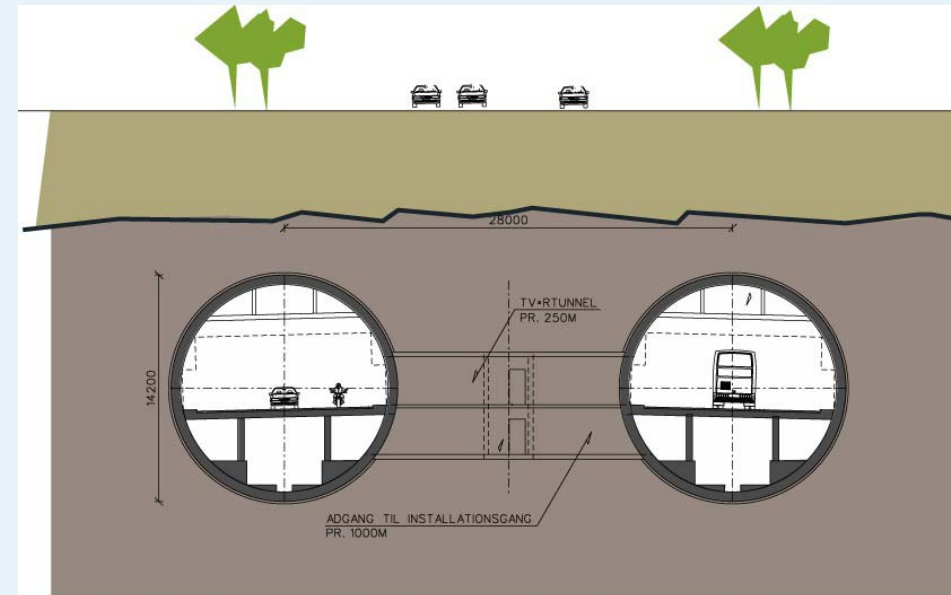
ITA/AITES



Nordhavnsforbindelsen (EIA on-going)
Copenhagen Municipality as developer

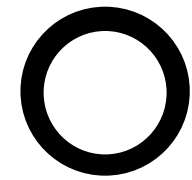


Cut & Cover Solution (Rambøll)



Bored Tunnel Solution (Rambøll)



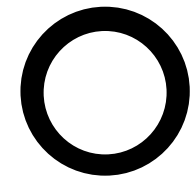


Roskilde Fjord Crossing (EIA on-going) Vejdirektoratet / Road Directorate



Short Immersed Tunnel Solution (Vejdirektoratet)



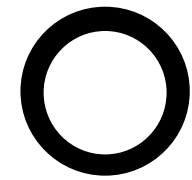


Silkeborg, Kombilinién decided 2008, Vejdirektoratet / Road Directorate

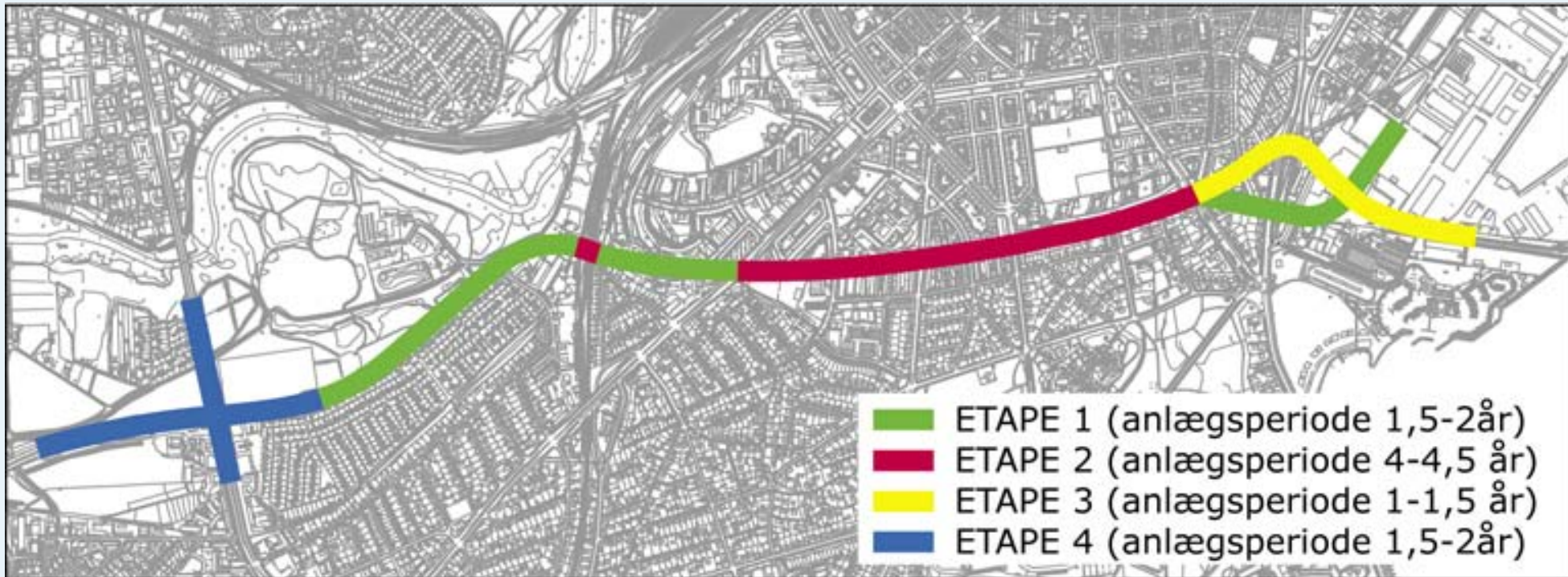


350 m Cut & Cover Solution (Vejdirektoratet)



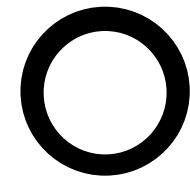


Marselis Boulevard Tunnel, Aarhus Municipality (EIA on-going)

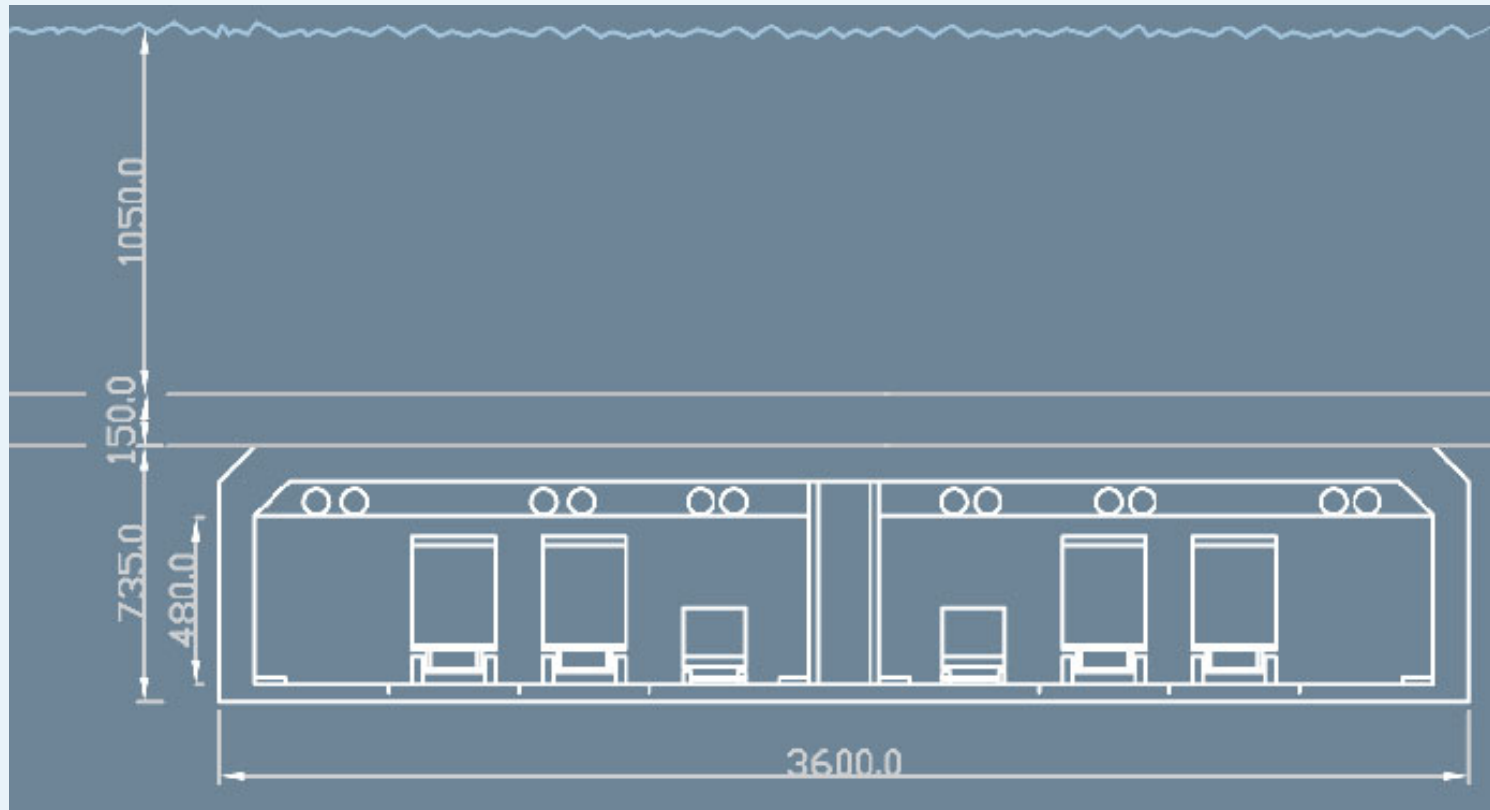


2.100 m Cut & Cover Road Tunnel Solution (Grontmij I Carl Bro)
Uni-directional tunnel, 2 x 2 lanes, EU supported infrastructure project



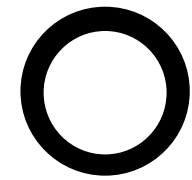


Copenhagen Harbour Tunnel - 20, 30, 40 billion DKr? Project



Cross section, 12 km Immersed Tunnel Solution (Københavnertunnelen Aps)
Many solutions have been considered along Copenhagen Harbour



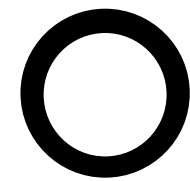


New Limfjord Tunnel ? Status unknown at the moment



New Immersed Tunnel Parallel Solution (Vejdirektoratet/Road Directorate)



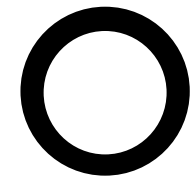


Copenhagen Metro Cityring - Phase 4 (Phase V, VI)

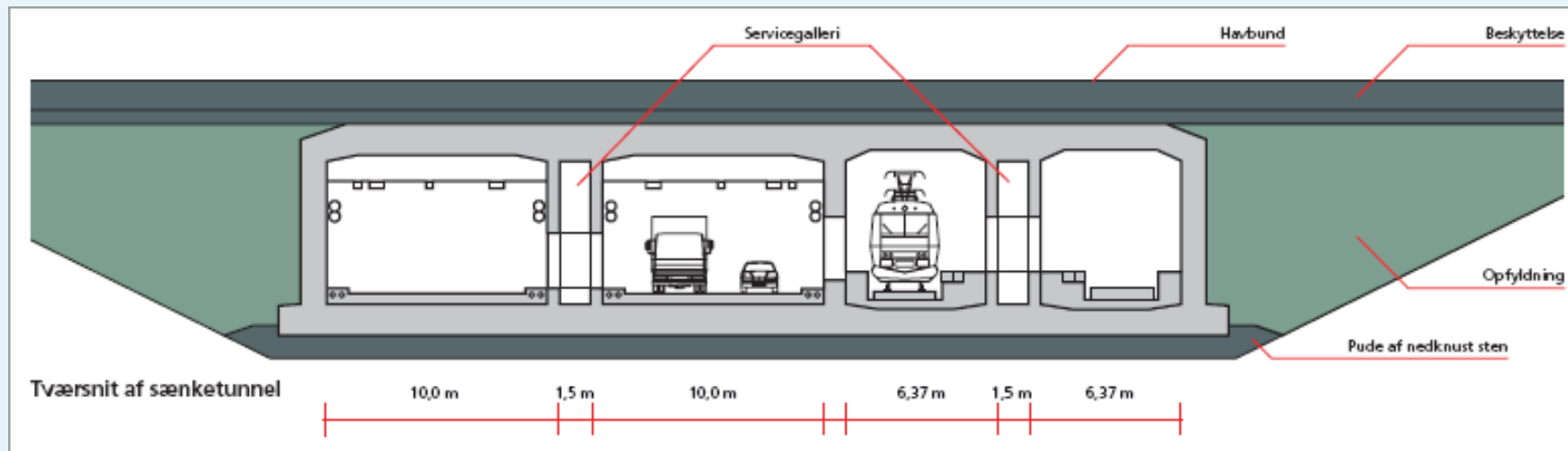


New 15,5 km TBM Tunnel Solution including 17 new underground MetroStations
2007 - 2018 (Metroselskabet)



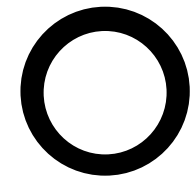


Fehmarnbelt Fixed Link (DK/D Agreement signed 3. September 2008), 2008 - 2018



Immersed Tunnel Solution ? or Bridge Solution ?



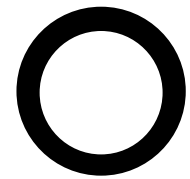


Fehmarnbelt Fixed Link 2008 - 2018



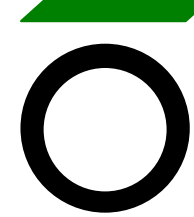
Immersed Tunnel Solution ? or Bridge Solution ?





- Helsingør - Helsingborg (Rail/Road Tunnel)
- Tunnel on the Faroe Islands (12 km Road Tunnel, Sandø - Strømø)
- New East Randers Fjord Crossing (Road Tunnel, EIA on-going)
- Copenhagen City (H.C. Andersens Boulevard) (Road Tunnel)
- Automated Underground Parking Facilities in City Centers expected to continue many years ahead
- And many many more projects are foreseen to be realised going underground due to environmental aspects (noise and pollution)





Once Again - Welcome to all of You
and do enjoy
the next presentations
and a social very good evening

