



Enabling Future Mobility



# SLAB TRACK SOLUTIONS FOR COPENHAGEN METRO



Source: Rhomberg Sersa Rail Group



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Source: Metroselskabet, Photo by Reginaldo Sales

Mariusz Kalinowski

Project Manager International

Questions:

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Title:

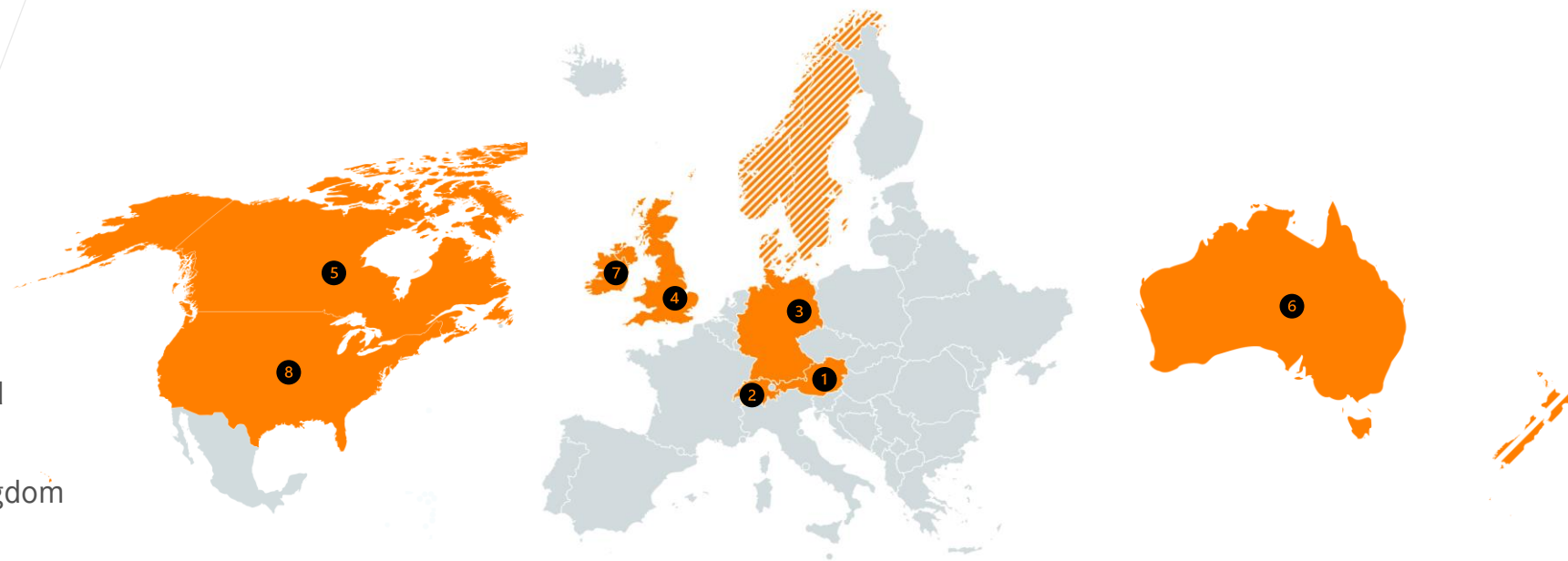
Enabling Future Mobility



# RHOMBERG SERSA RAIL GROUP

## INTERNATIONAL PRESENCE

- 1 Austria
- 2 Switzerland
- 3 Germany
- 4 United Kingdom
- 5 Canada
- 6 Australia
- 7 Ireland
- 8 USA



# OUR EXPERTISE

## Infrastructure

- Track construction - mechanical and commercial
- Slab track and ballasted track expertise
- Track and switch maintenance
- Renovation of railroad tunnels
- Welding
- Electrical installations, traction power supply, communication technology
- Engineering. Project Management
- Innovative products

## Vehicles

- Maintenance, servicing, operation, purchase and sale of railway vehicles
- Logistics and operation as a rail transport company



# PRODUCT DEVELOPMENT AT RSRG

## YOUR BENEFIT IN FOCUS, THE FUTURE IN MIND

Important concept from the outset:

- **What** specific problems and challenges will the product be able to solve for infrastructure operators or contractors?
- **Why** will customers rely on the products or services of the Rhomberg Sersa Rail Group?
- Note:
  - product benefits can be completely different for different customer groups for one and the same product!
  - greater awareness of the specific benefits facilitates continuous optimisation of products and cooperation with customers and partners!



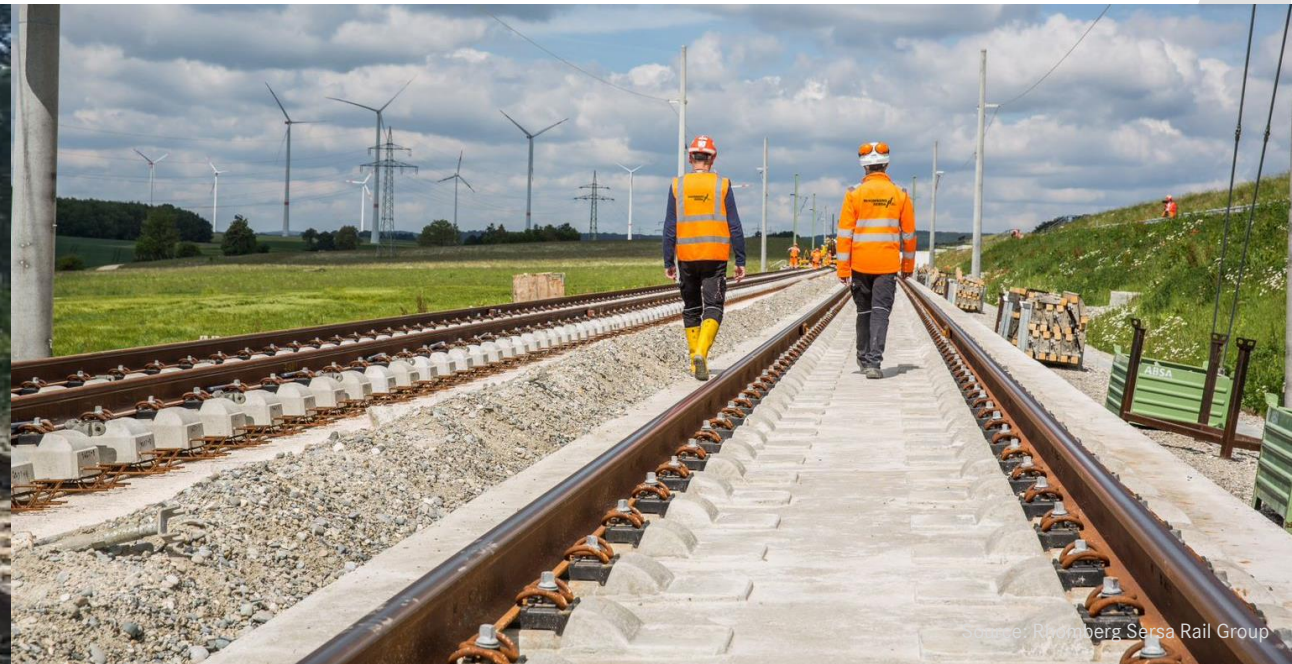
# SLAB TRACK

WHAT





**BALLASTED TRACK**




**SLAB TRACK**

# SLAB TRACK

## WEBINAR: ENABLING FUTURE MOBILITY #1 PRODUCTS

Enabling Future Mobility – Event 1: Products - Webinar Recording



RHOMBERG  
SERSA RAIL  
GROUP

Enabling Future Mobility

WEITERE VIDEOS

0:02 / 40:24

5

# COPENHAGEN RAPID TRANSIT AT A GLANCE



Copyright: Ty Stange, Picture: Wonderful Copenhagen

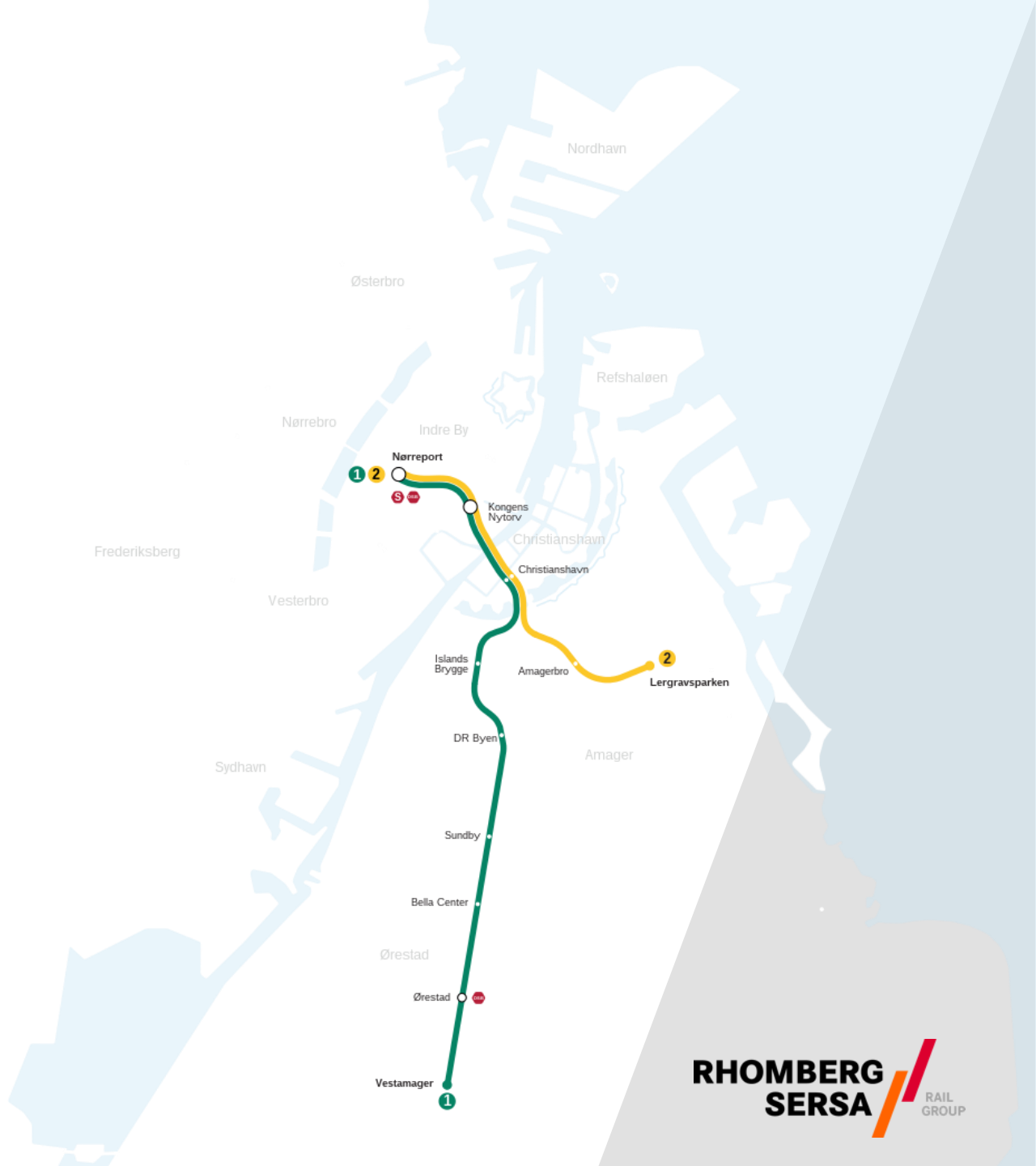


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# THE COPENHAGEN METRO HISTORY AND DEVELOPMENT

➔ **2002**

- M1 Vestamager to Nørreport St.
- M2 Lergravsparken to Nørreport St.



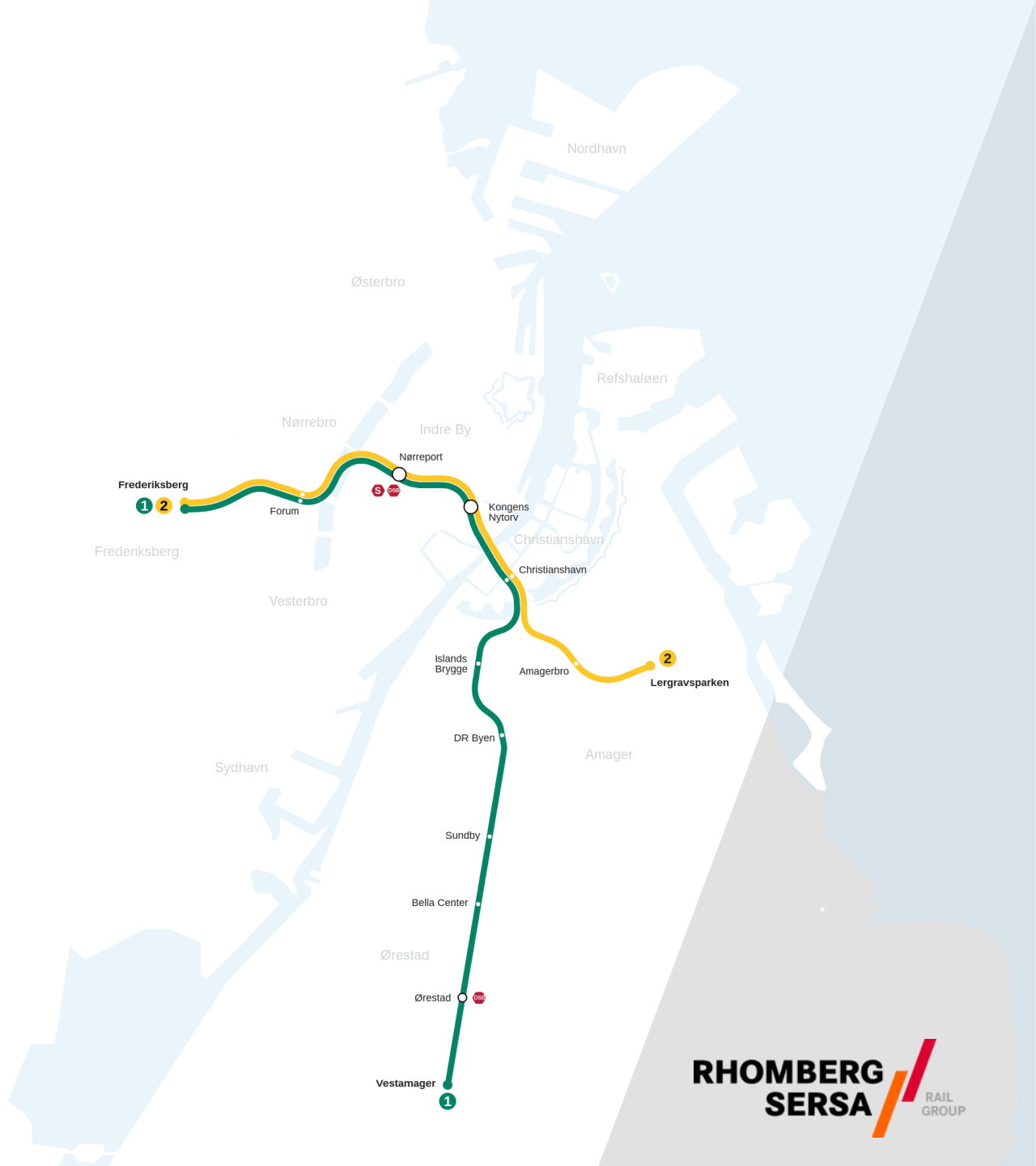
# THE COPENHAGEN METRO HISTORY AND DEVELOPMENT

➔ **2002**

- M1 Vestemager to Nørreport St.
- M2 Legravsparke to Nørreport St.

➔ **2003**

- M1 and M2 extended to Frederiksberg



# THE COPENHAGEN METRO HISTORY AND DEVELOPMENT

➔ **2002**

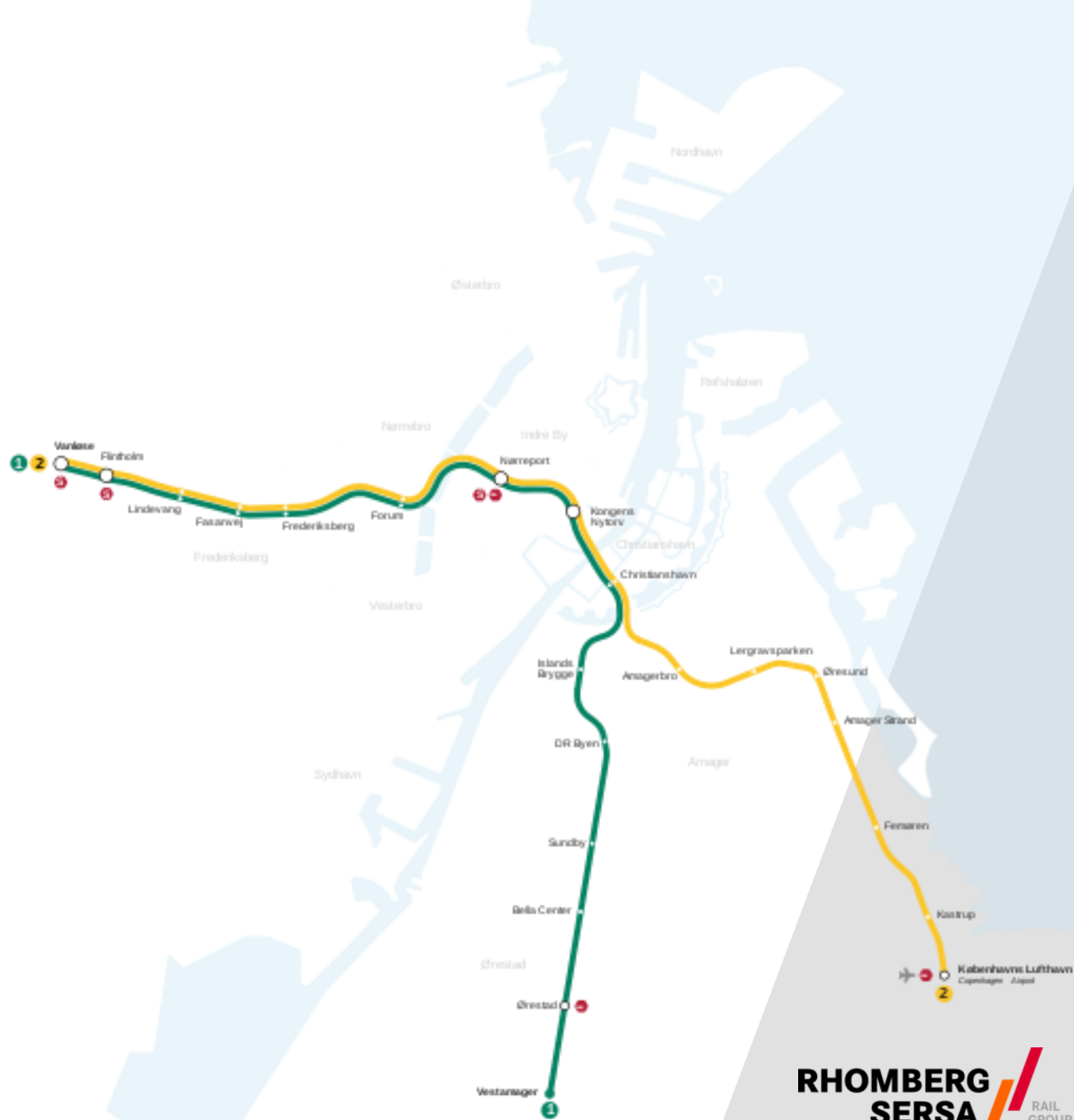
- M1 Vestemager to Nørreport St.
- M2 Legravsparken to Nørreport St.

➔ **2003**

- M1 and M2 extended to Frederiksberg

➔ **2007**

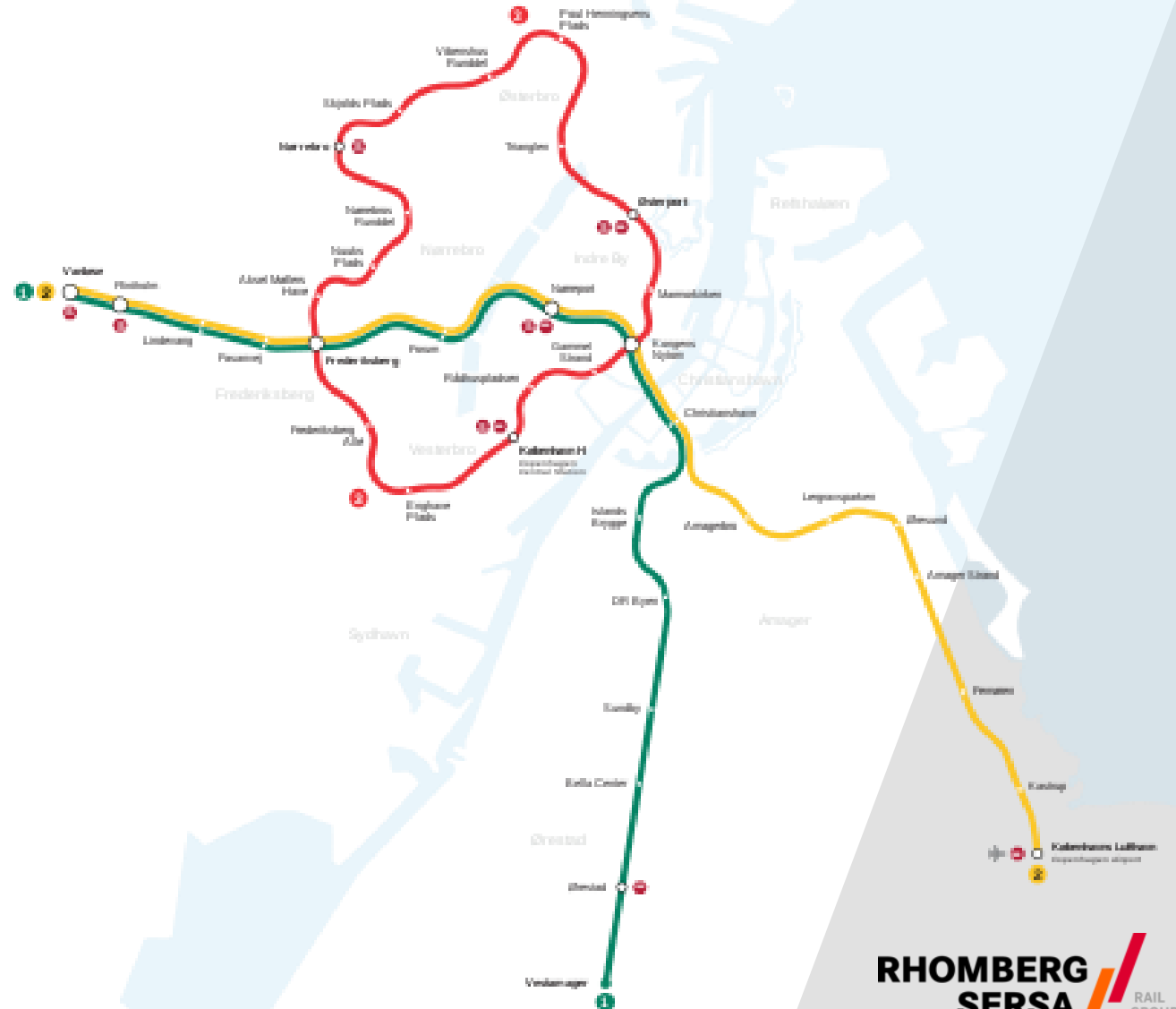
- M1 and M2 extended to Vanløse
- M2 connection to CPH Airport



# THE COPENHAGEN METRO HISTORY AND DEVELOPMENT

➔ 2019

- M3 Cityringen opened



# THE COPENHAGEN METRO HISTORY AND DEVELOPMENT

➔ **2019**

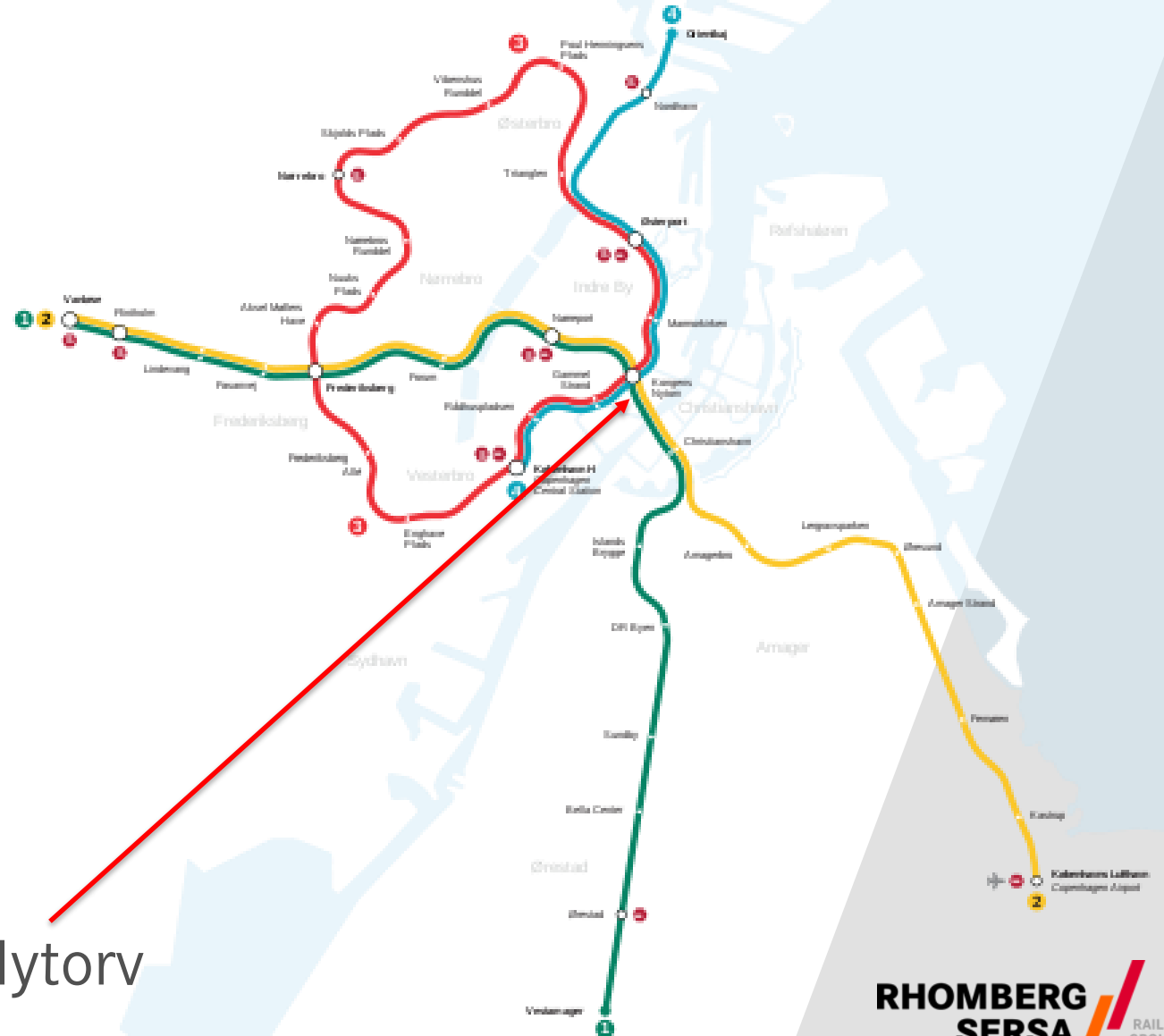
- M3 Cityringen opened

➔ **2020**

- M4 line to Nordhavn opened



Kongens Nytorv





# THE COPENHAGEN METRO HISTORY AND DEVELOPMENT

➔ **2019**

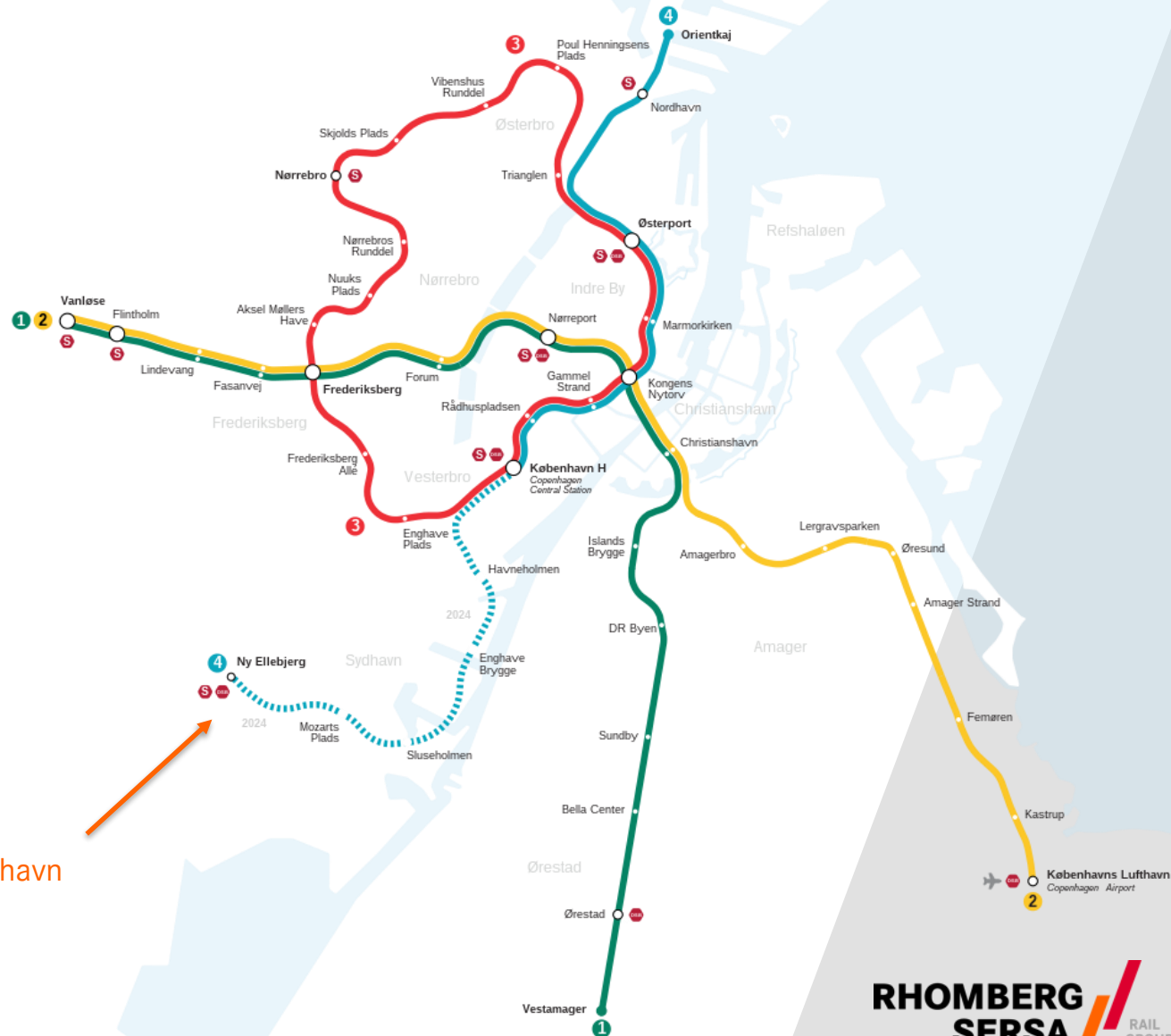
- M3 Cityringen opened

➔ **2020**

- M4 line to Nordhavn opened

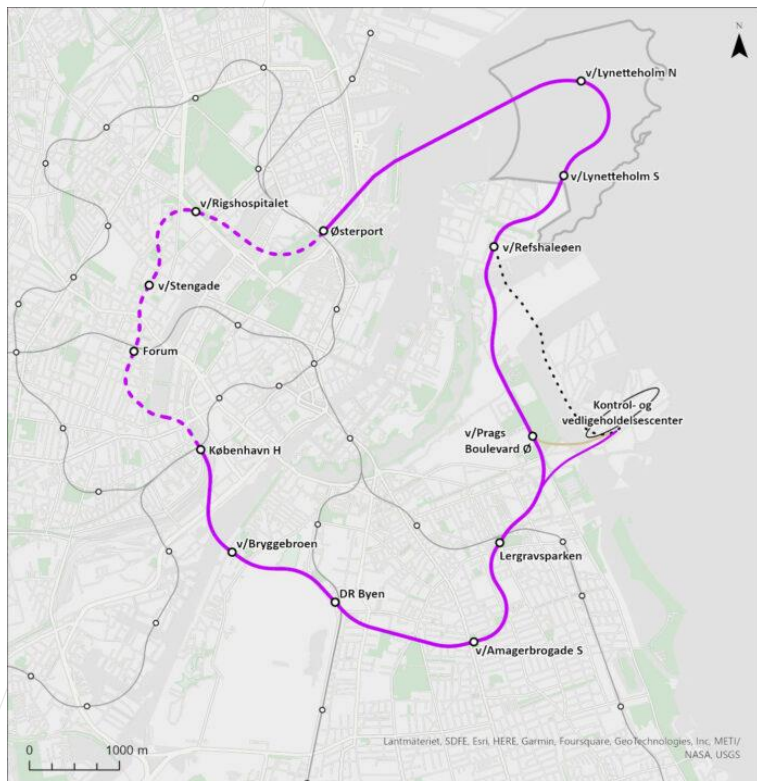
➔ **2024**

- Expected opening of M4 Branch off to Sydhavn



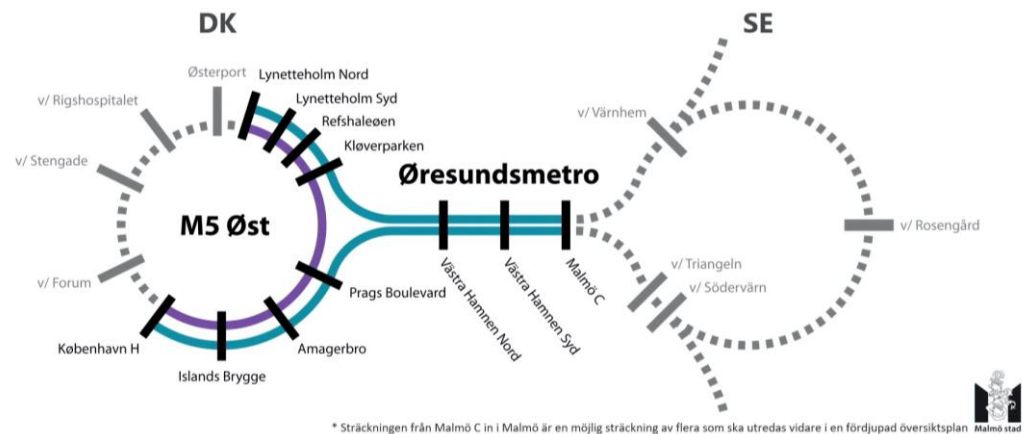
# THE COPENHAGEN METRO

## THE FUTURE



Source: Københavns Kommune

## Öresundsmetron integrerad med ny metrolinje M5 Öst



Source: Malmö Stad

# COPENHAGEN RAPID TRANSIT AT A GLANCE



**S-tog** Urban rail

**Metro** Underground

**Alle dage** All days

- Blue Line A
- Green Line B
- Orange Line C
- Red Line D
- Yellow Line E

**Man-fre dagtimer** Mon-Fri daytime

- Blue Line E
- Red Line H

**Myldretid** Peak hours

- Blue Line E
- Red Line H

**Tag stopper kun aften, weekend og helligdage** This stops only evenings, weekends and holidays only

- Blue Line E
- Red Line H

**Øvrige tog** Other rail services

- Green Line M
- Yellow Line N
- Red Line O
- Blue Line P

**Regional, Øresunds- og intercitytog** Regional, Øresund, and international rail

- Green Line M
- Yellow Line N
- Red Line O
- Blue Line P

**Lokal tog** Local rail

- Green Line M
- Yellow Line N
- Red Line O
- Blue Line P



# THE COPENHAGEN METRO AT A GLANCE



**24/7**  
**DRIVERLESS**  
**TRAIN EVERY 3 MINUTES**

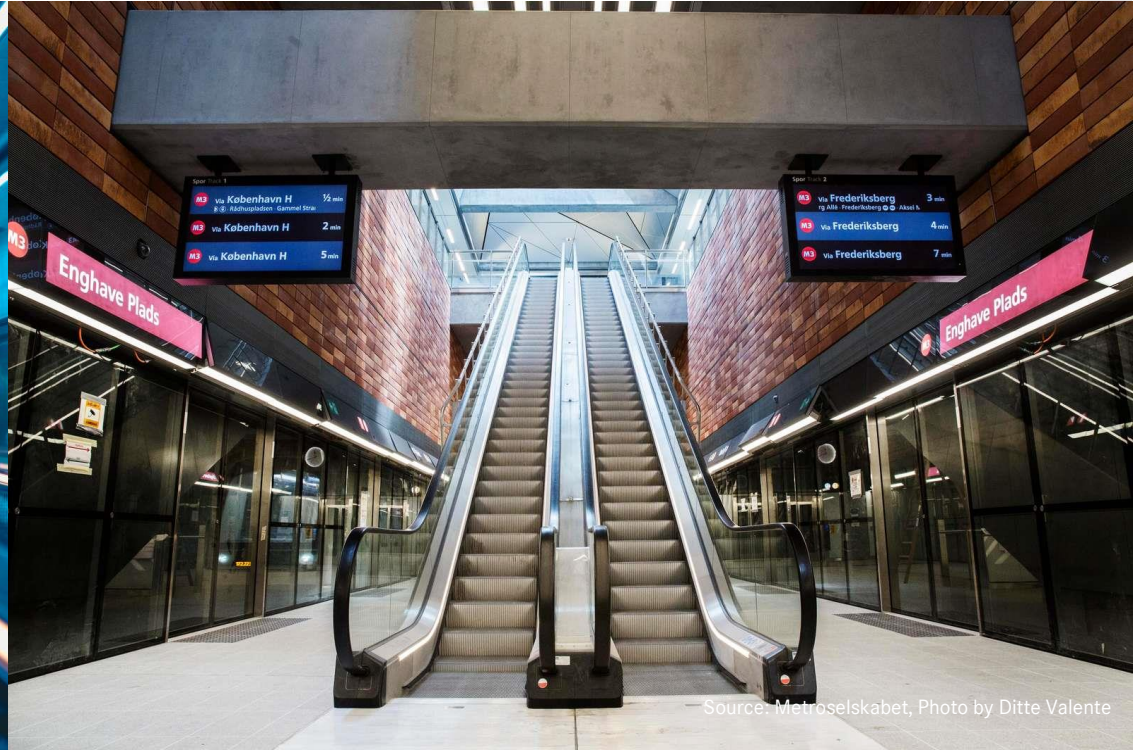
# THE COPENHAGEN METRO TRANSFORMING THE CITY

THE COPENHAGEN METRO CONCEPT:



- Small units (39m)
- Short headway, 90sec
- Small stations
- Tight tunnel, diameter: 4,9m

# THE COPENHAGEN METRO TRANSFORMING THE CITY



# M4 LINE TO SYDHAVN

## BACKGROUND FOR CHOOSING SLAB TRACK

### WHY SLAB TRACK FOR COPENHAGEN METRO?

- Savings on civil works balance out the extra track cost
- No room for ballast tamping
- Minimizing track side works
- Avoiding dust in tunnels
- Using area between rails as escape route
- Little tolerance for vehicle movements
- Lightweight, fully-automated driverless metro system
- 24/7 operation
- High level of reliability (>98%)

# M4 LINE TO SYDHAVN

## CRSH4 CONTRACTOR



The contract to the JV Rhomberg Efacec covers the design and construction for the following parts of the transportation system:

- Permanent Way (PW)
- Traction Power (TP)
- Power Supply (PS)
- Local SCADA (LS)





# M4 LINE TO SYDHAVN

## FACTS

- 4,6 km long tunnel (2 tubes) with 5 Stations:
  - Havneholmen
  - Enghave Brygge
  - Sluseholmen
  - Mozarts Plads
  - Ny Ellebjerg
- 2 shafts for logistics, switches and crossings:
  - Ørstedsverket
  - Gåsebæk
- 2 crossovers (switches and cross)
- Installation of slab track systems:
  - LVT HA
  - MSS





# M4 LINE TO SYDHAVN

## SLAB TRACK SYSTEMS



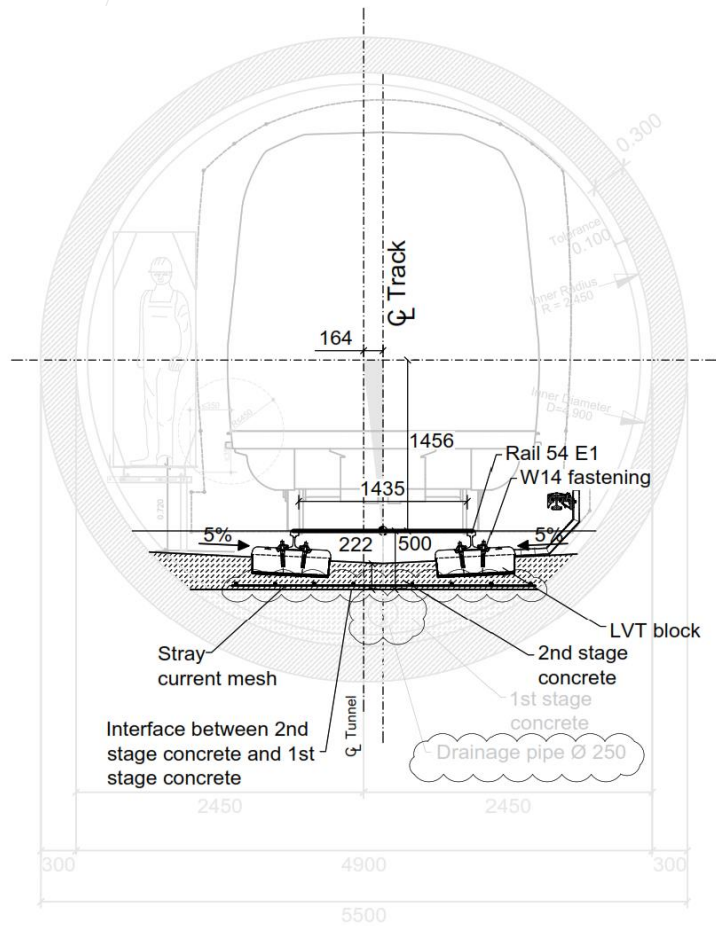
Low Vibration Track  
(LVT HA)



Mass Spring System Direct Fixation Track  
(MSS)

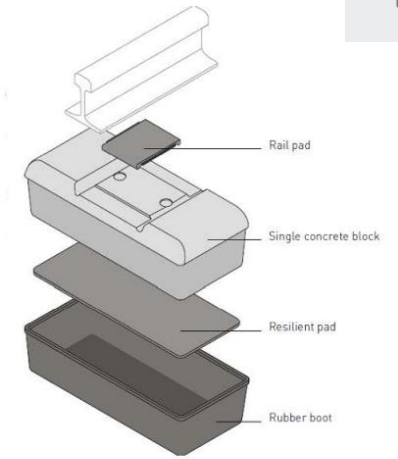
# M4 LINE TO SYDHAVN

## THE LVT HA SLAB TRACK SYSTEM



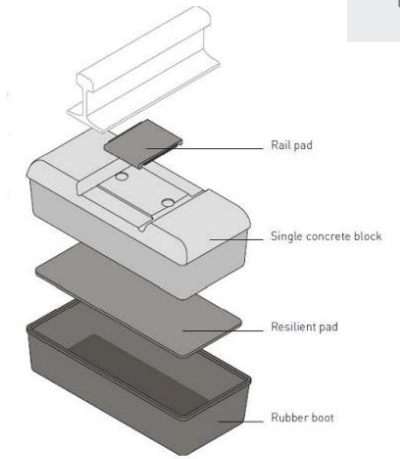
### Structure

- 1 layer of concrete C30/37
- LVT HA with W14 fastening
- 54E1 Rail
- Stray current mesh



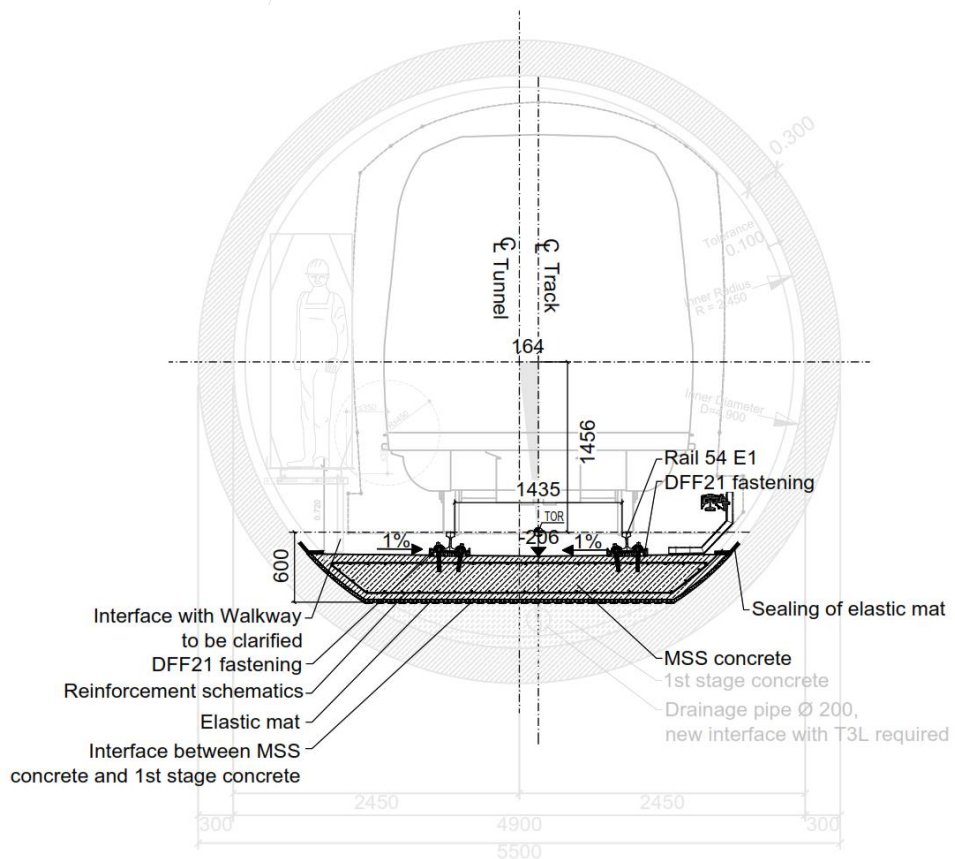
# M4 LINE TO SYDHAVN

## THE LVT HA SLAB TRACK SYSTEM



# M4 LINE TO SYDHAVN

## THE MSS SLAB TRACK SYSTEM

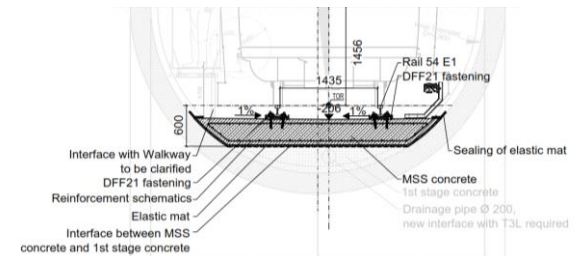


### Structure

- Elastic mats
- Reinforcement
- 2 layers of concrete C40/50
- DFF 21 Fastening
- 54E1 Rail

# M4 LINE TO SYDHAVN

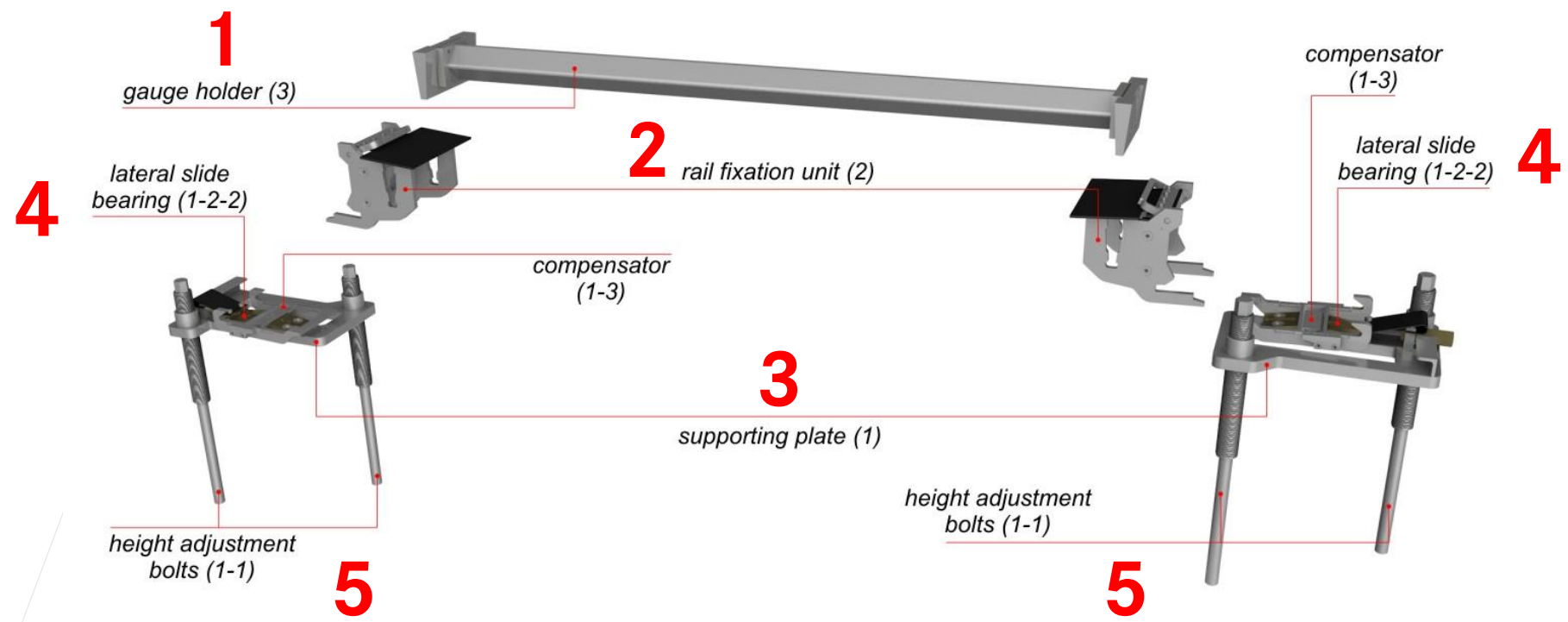
## THE MSS SLAB TRACK SYSTEM





# M4 LINE TO SYDHAVN TECHNOLOGY USED

RhoTAS – VERSATILE TRACK ADJUSTMENT SYSTEM



INSTALLATION METHOD: TOP-DOWN

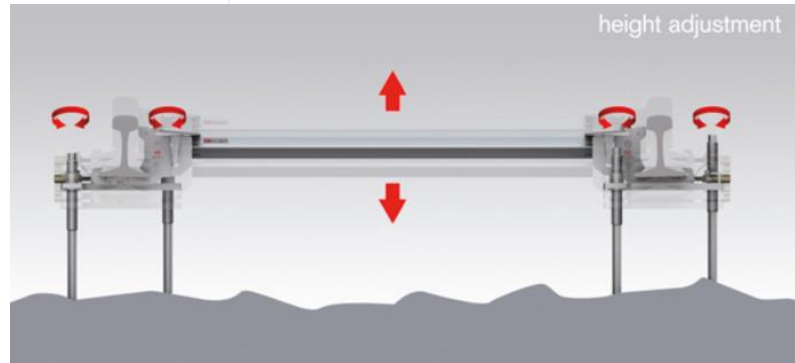




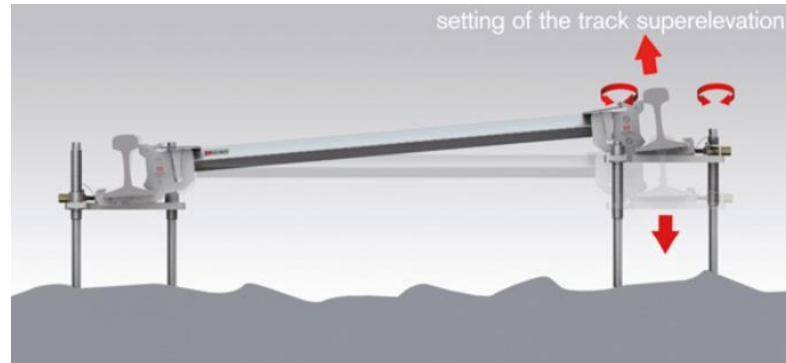
# M4 LINE TO SYDHAVN TECHNOLOGY USED

RhoTAS – VERSATILE TRACK ADJUSTMENT SYSTEM

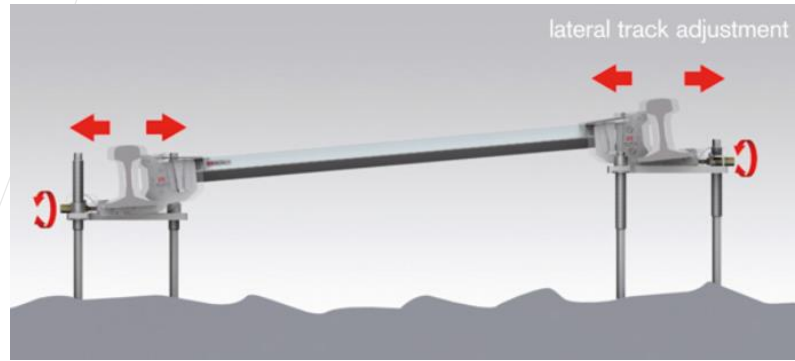
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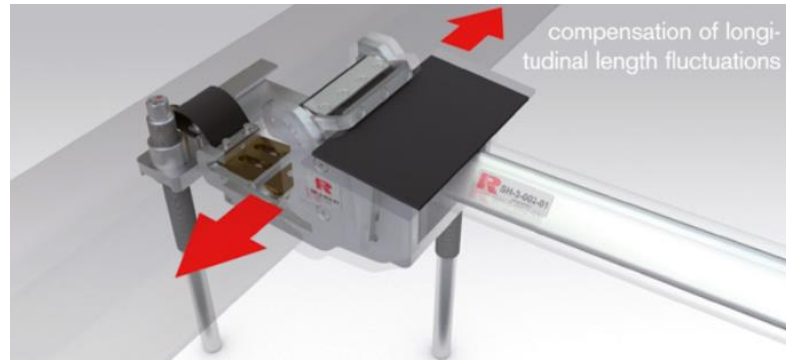
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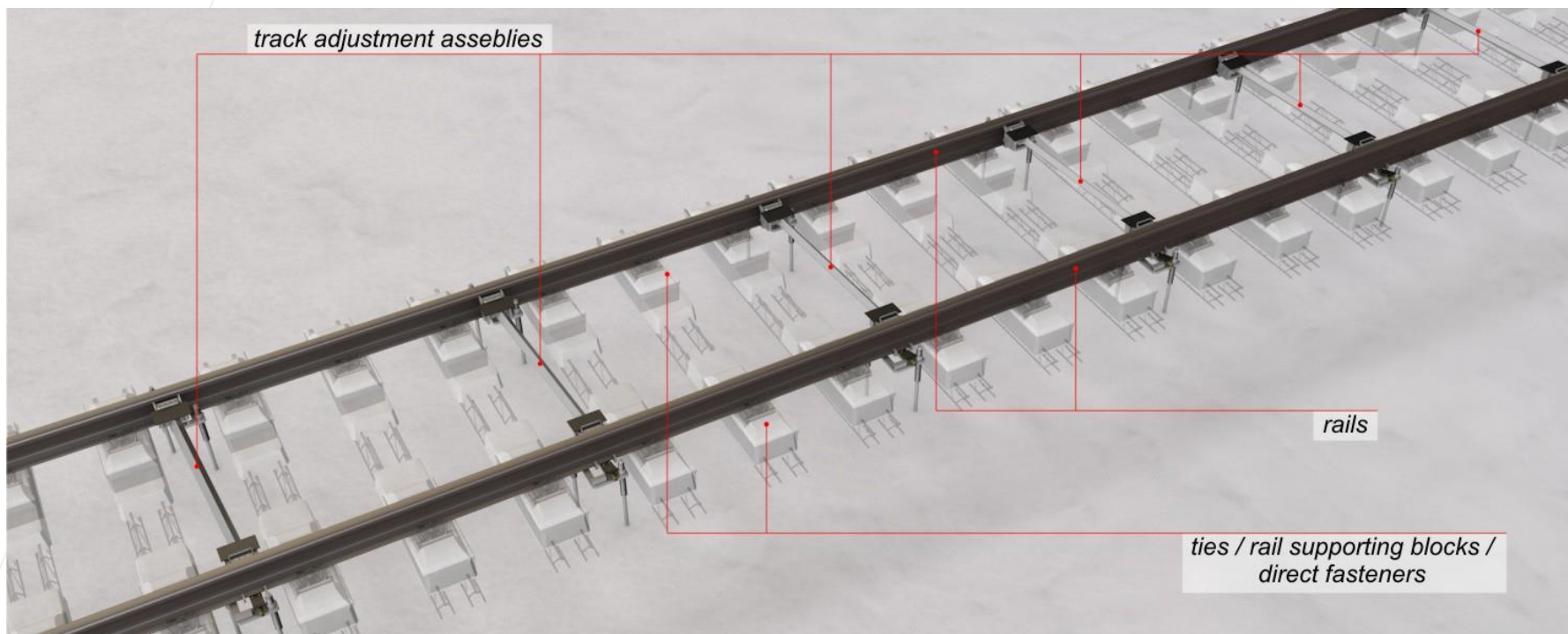


# M4 LINE TO SYDHAVN

## TECHNOLOGY USED



RhoTAS – VERSATILE TRACK ADJUSTMENT SYSTEM



# M4 LINE TO SYDHAVN

## TRACKS INSTALLATION TOP-DOWN

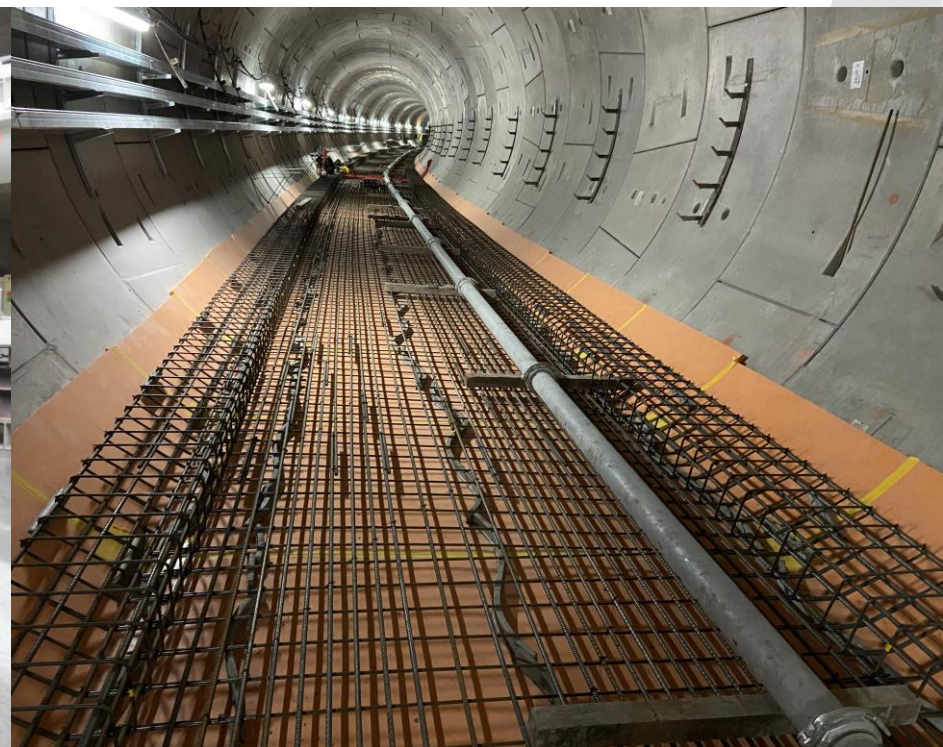


# M4 LINE TO SYDHAVN CHALLENGES



## LIMITED ACCESSIBILITY LOGISTICS

# M4 LINE TO SYDHAVN SOLUTIONS



## VERTICAL SUPPLIES DELIVERIES THROUGHOUT TUNNELS

# M4 LINE TO SYDHAVN

## RESPECT AND DIVERSITY

WE STAND FOR:



- Work safe – home safe!
- Respect and cooperation
- Diversity that brings better ideas





**M4 LINE TO SYDHAVN**  
**RESPECT AND DIVERSITY**



**WE ARE ONE!**

ENABLING FUTURE MOBILITY  
QUESTIONS AND ANSWERS

**info@rsrg.com**  
**#EnablingFutureMobility**



## ENABLING FUTURE MOBILITY

### NLRA WEBINAR PROGRAM #3: DIGITAL TOOLS AND SERVICES



Ralf Sommer – Project Manager BIM Implementation  
Rhomberg Sersa Rail Group – Bregenz, Austria



## DIGITAL RAIL SERVICES

15. March 2023; 16:00 CET  
Book the date!

**Linked in**

**YouTube**

@RhombergSersaRailGroup

# THANK YOU!

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Enabling Future Mobility

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