

PÅLDAG 15, Göteborg, 21.05.2015



Marieholmstunneln – stödkonstruktion vid älven

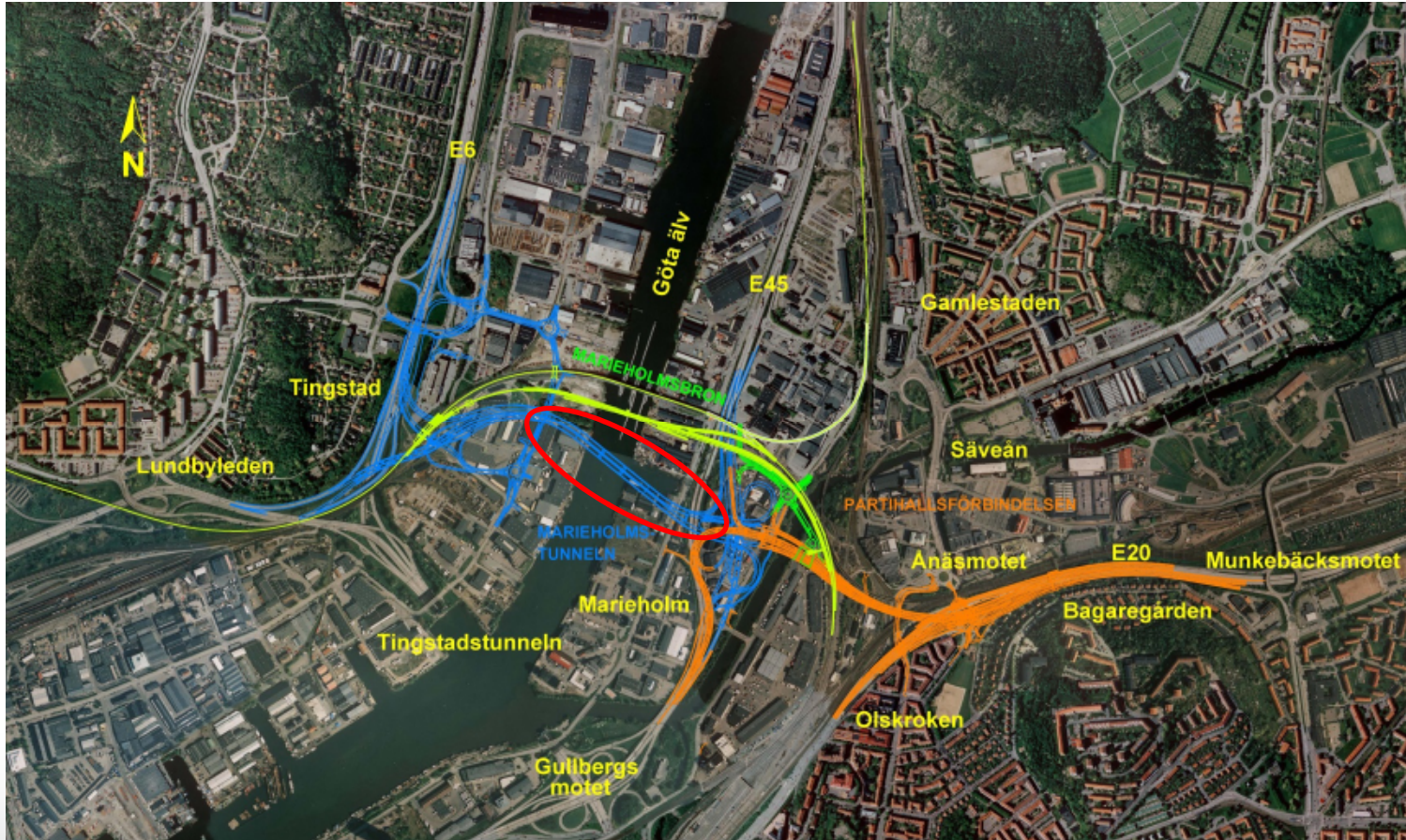


Dipl.-Ing. Johannes Glückert, technical manager

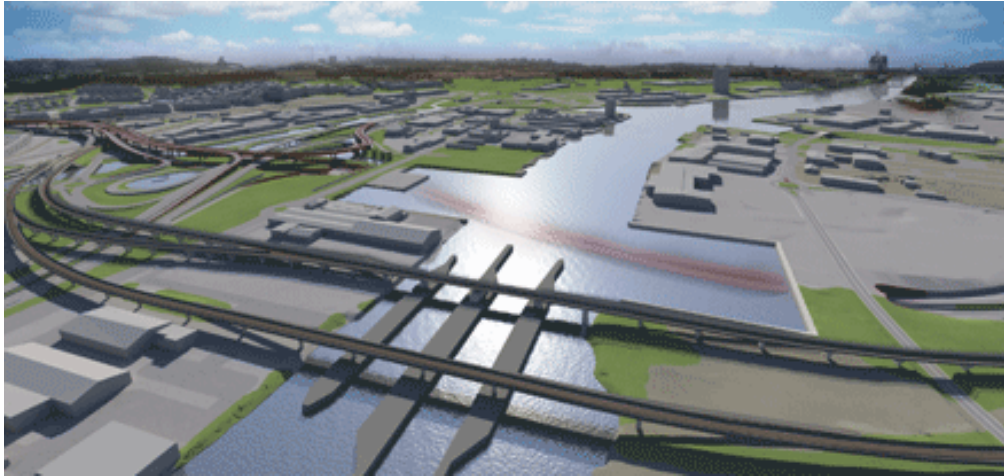
Dr.-Ing. Christiane Hof, design manager

ZÜBLIN

Marieholmstunneln – del av Marieholmsförbindelse



Marieholmstunneln – del av Marieholmsförbindelse



Client



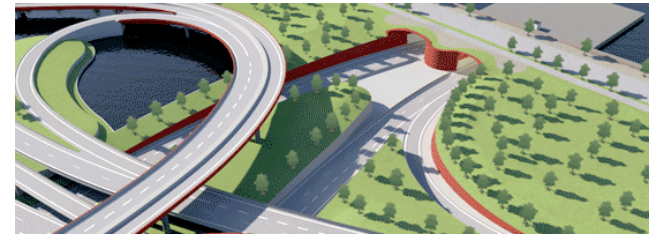
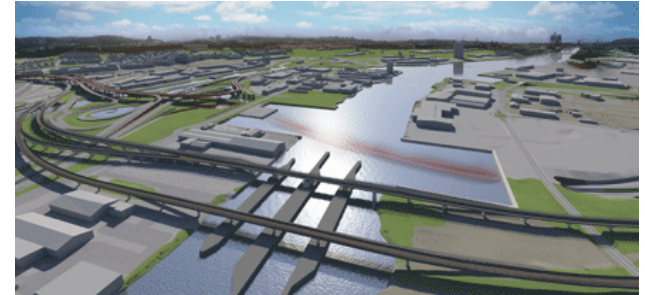
Contractor



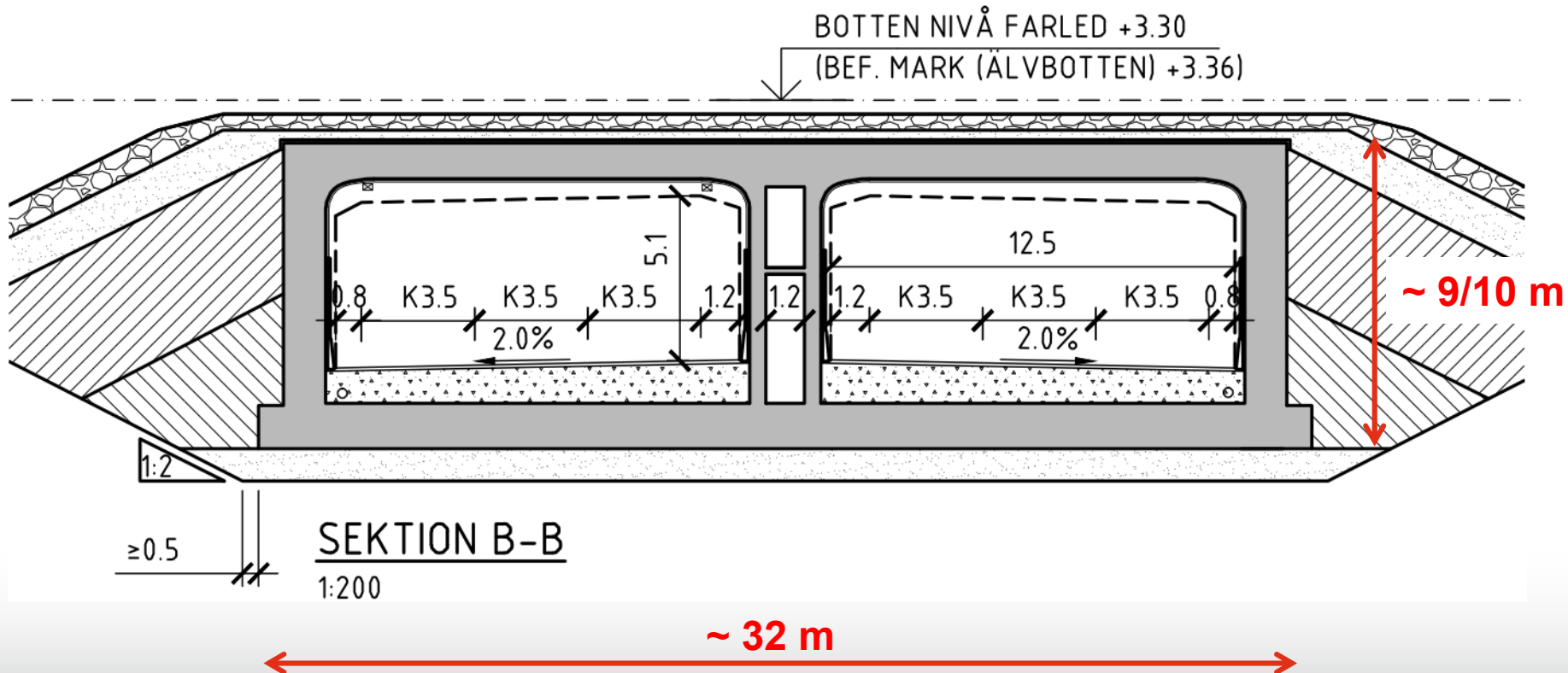
- Design and Build contract
- Contract amount SEK 1 533 499 000
- Construction time 06/2014 – 10/2020

Marieholmstunneln – del av Marieholmsförbindelse

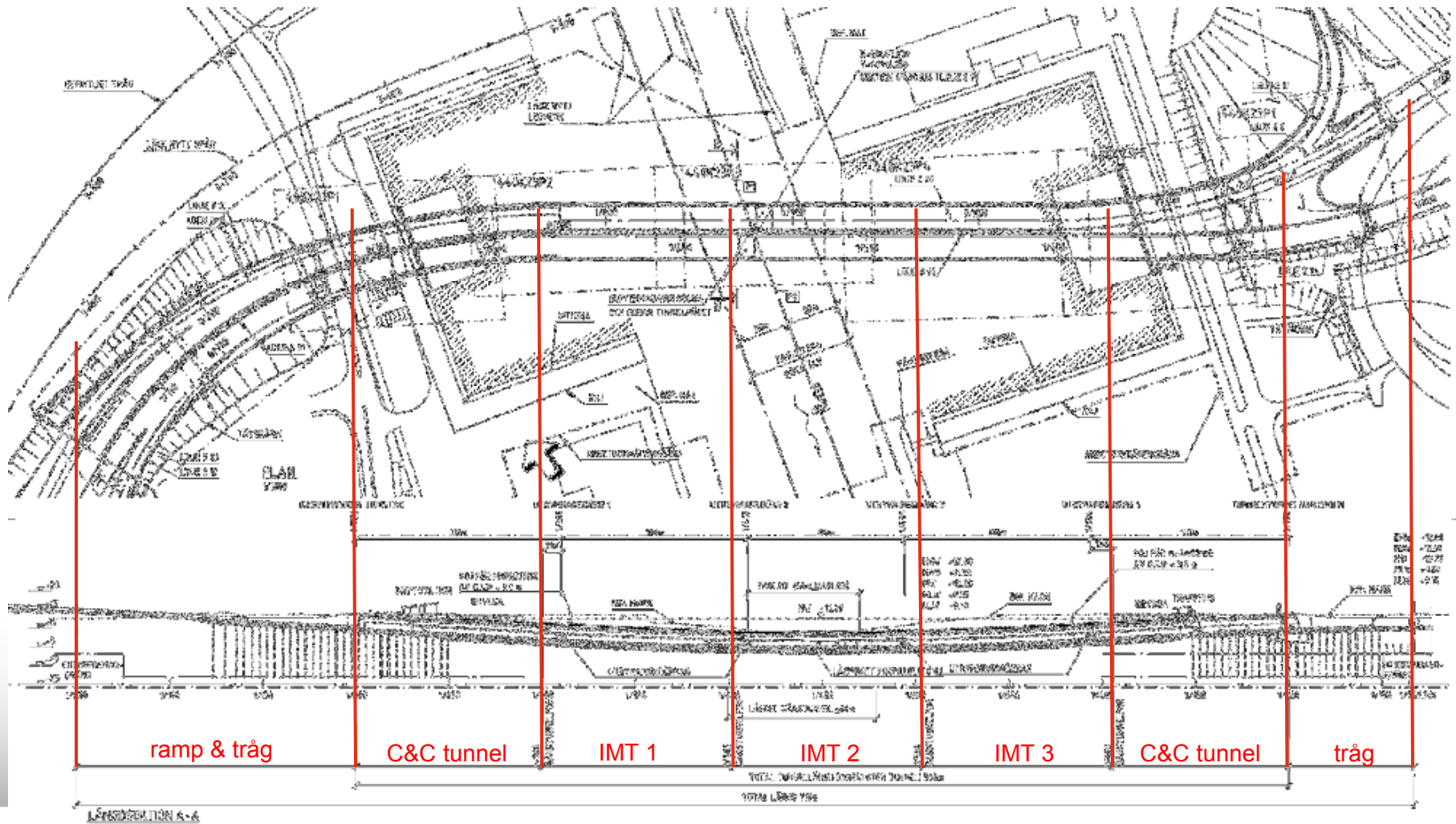
- Dimensioned for 90 000 vehicles per day
- Three lanes in each direction
- Length 500 m
- Traffic connections on both sides of the tunnel



Marieholmstunneln overview



Marieholmstunneln overview



INTRODUCTION

GEOLOGY

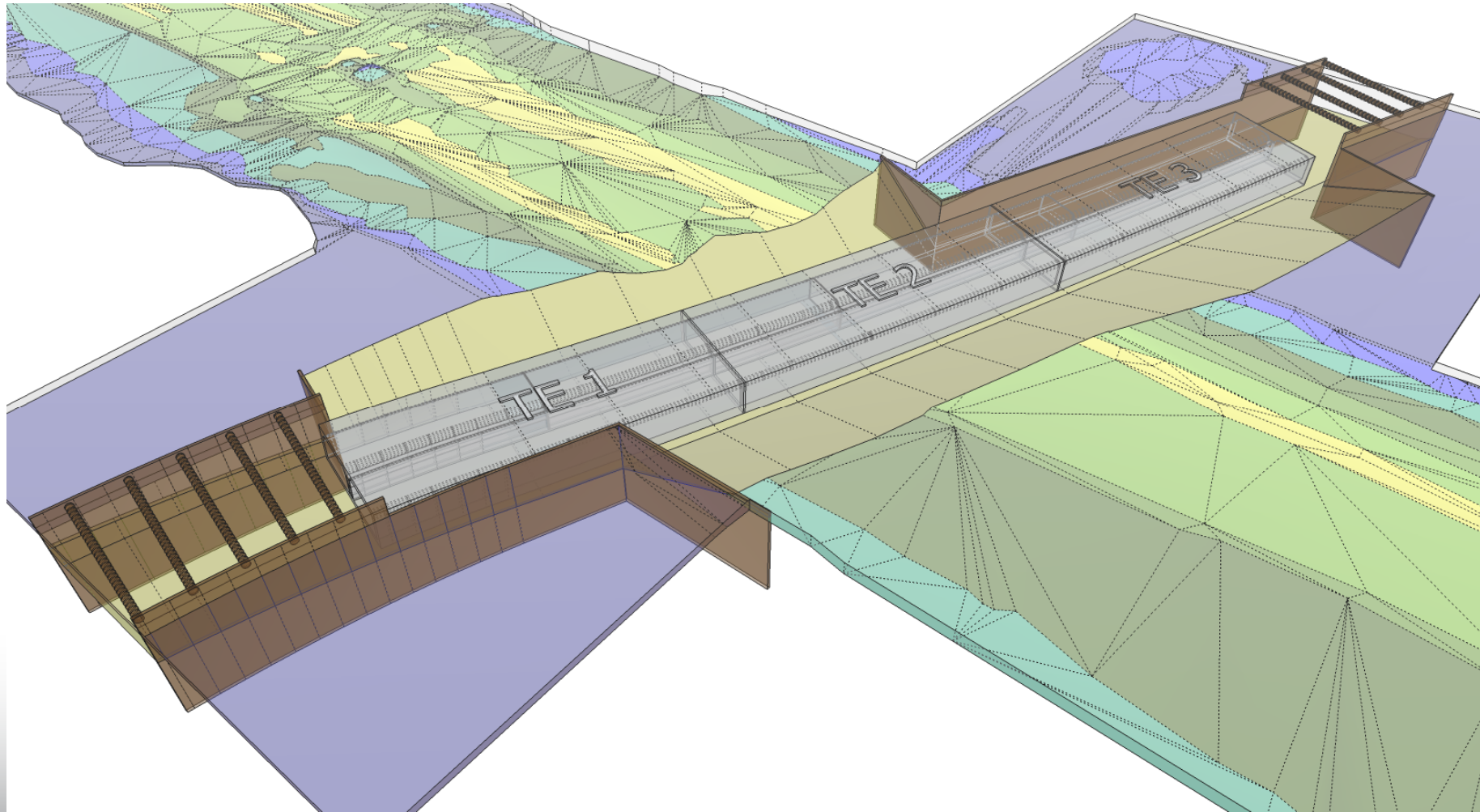
DRYDOCK
DESIGN

DRYDOCK
EXECUTION



ZUBLIN

Immersed tunnel and Cut & Cover



INTRODUCTION

GEOLOGY

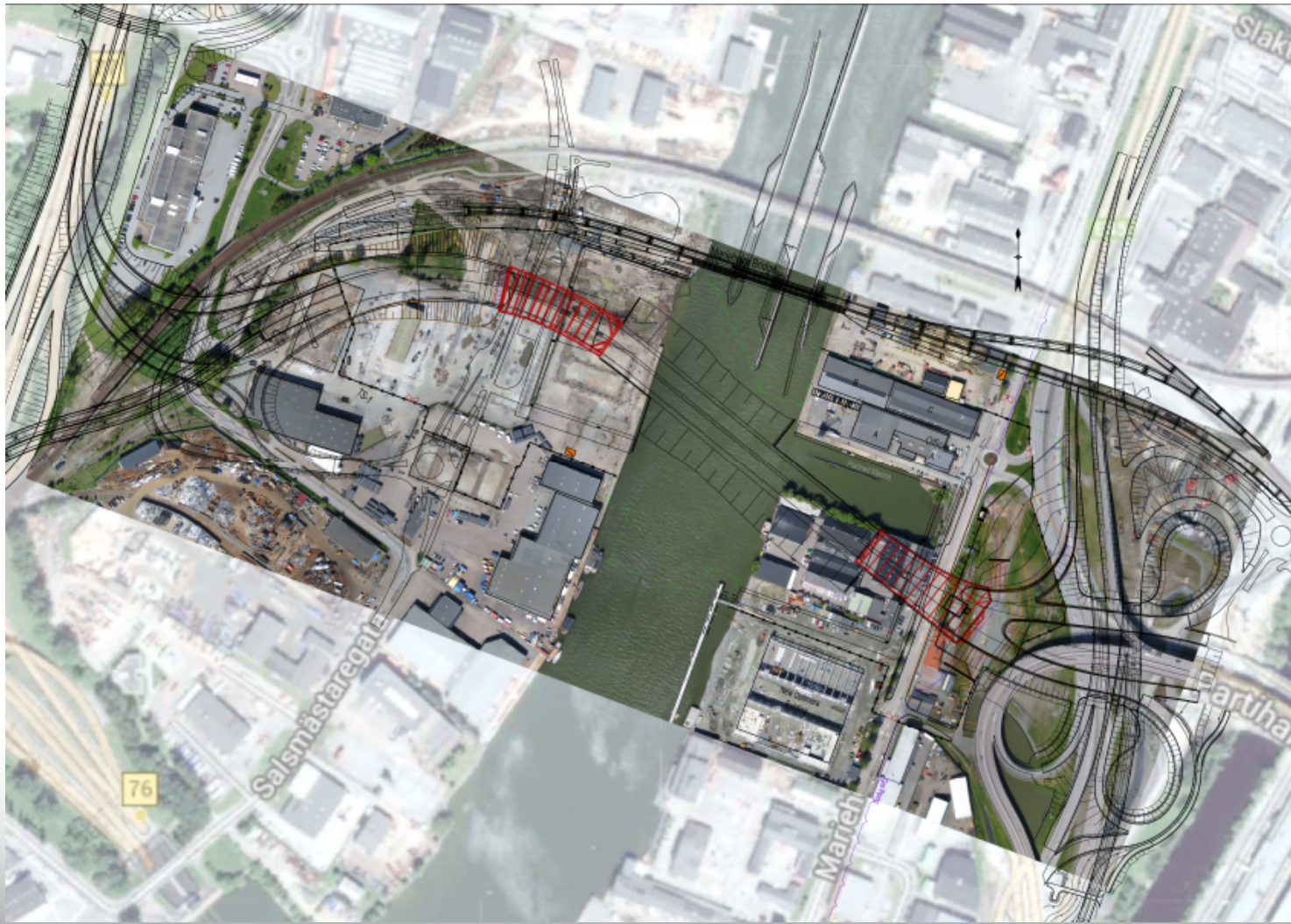
DRYDOCK
DESIGN

DRYDOCK
EXECUTION



ZUBLIN

Temporary works



INTRODUCTION

GEOLOGY

DRYDOCK
DESIGN

DRYDOCK
EXECUTION



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Soil conditions

Top layer: 0,5 – 2,0 m fill material/dry crust clay

Main layer: 60m – 100m soft clay, slightly overconsolidated OCR = 1,25

Granular layer: 0 – 15 m overlaying rock

| Inom Göta älv | | Tingstad samt Marieholm | |
|---------------|---------------------------------|-------------------------|---------------------------------|
| Nivå | C_u direkt skjuvning (kPa) | Nivå | C_u direkt skjuvning (kPa) |
| +10 | 5 | +10 | 12 |
| +8 | 8 | +8 | 12 |
| -16 | 44 | -16 | 44 |
| -27 | 56 | -27 | 56 |
| -65 | 113 | -65 | 113 |



Design Drydock

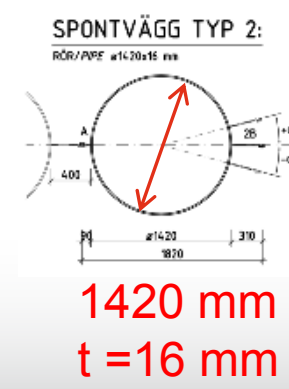
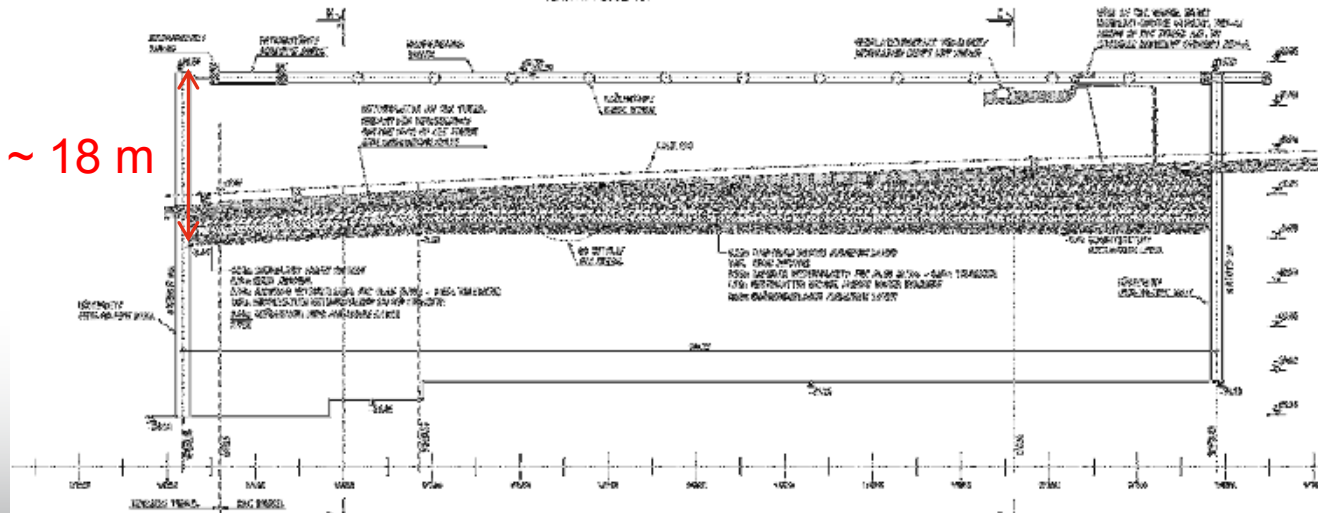
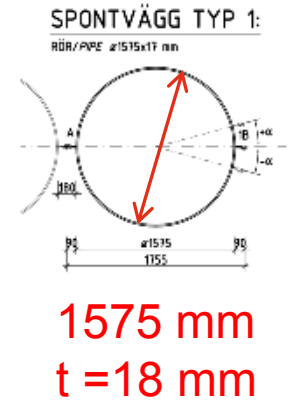
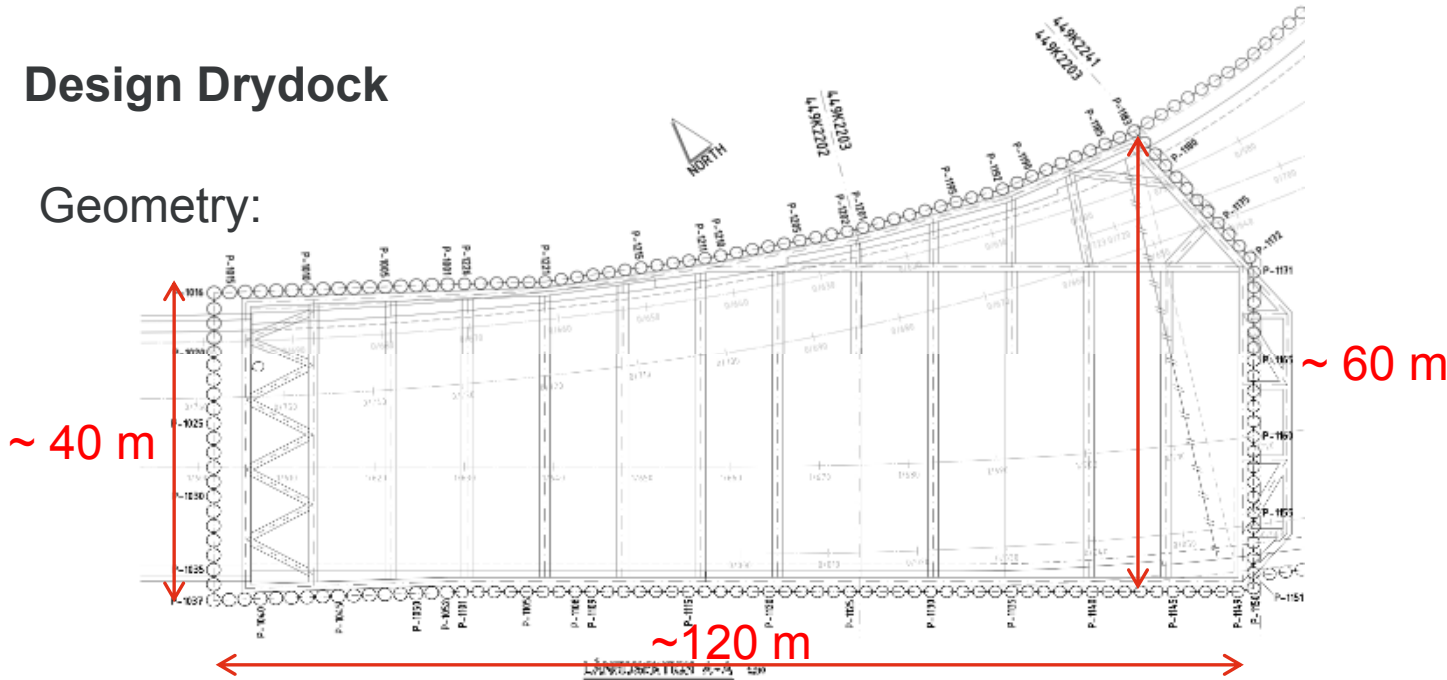
General concept:

- *Wet excavation*
- *Stiff retaining wall* in form of pipe-to-pipe wall
- *2 strut levels:*
 - Top strut level above surface
 - Bottom strut level partly installed under wet conditions:
 - drainage layer: no built up of water pressure
 - underwater concrete slab: short term, only normal forces
 - reinforced concrete slab: longterm, bending due to heave
- *Monitoring*

Design Drydock



Geometry:



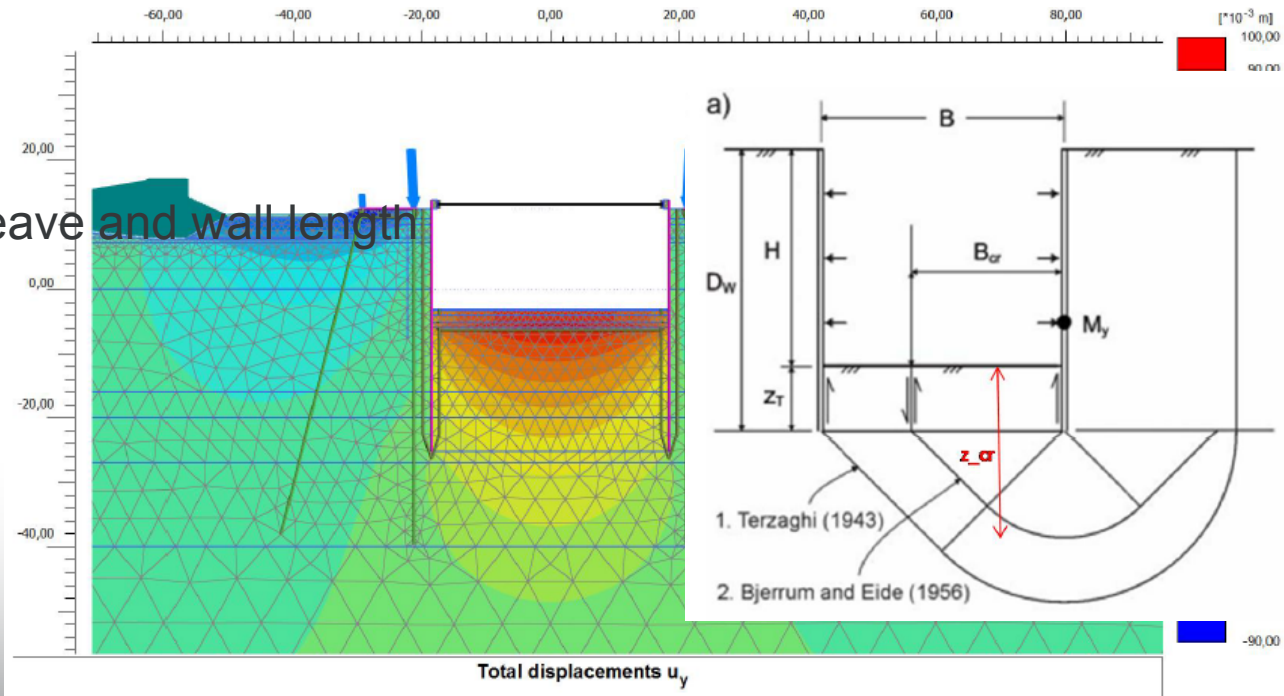
Design Drydock

FEM calculation with Plaxis

Soil model: Hardening Soil small strain (HSss), undrained A

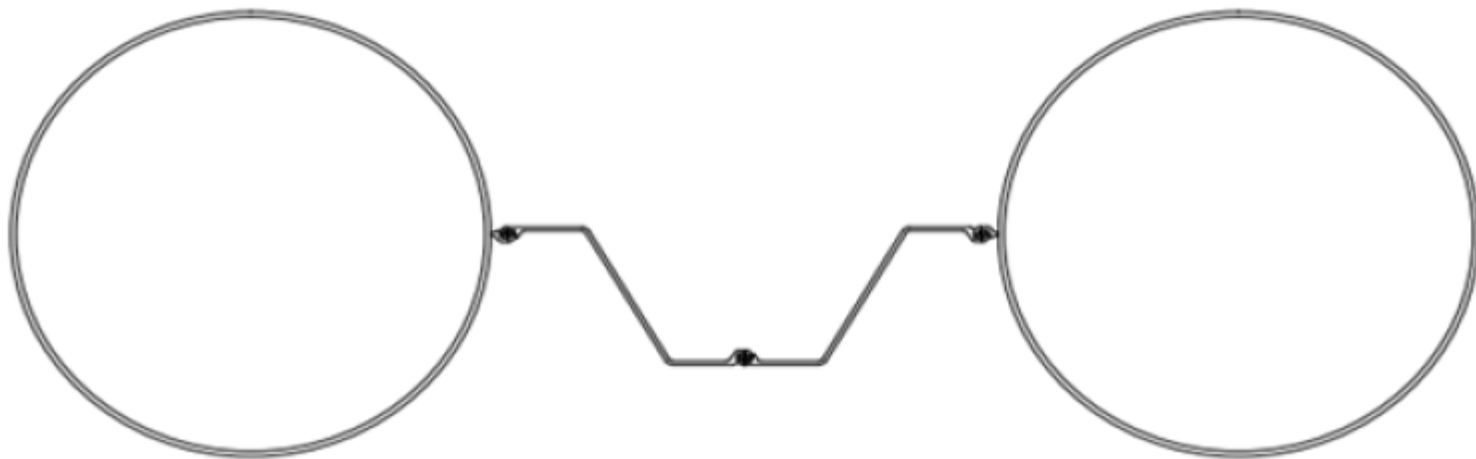
Consolidation time for different working steps is implemented to calculate the time depending heave

Additional
Overall stability: base heave and wall length
with analytical check



Design Drydock: Pipe-to-pipe wall versus Combiwall

Typical Combiwall:



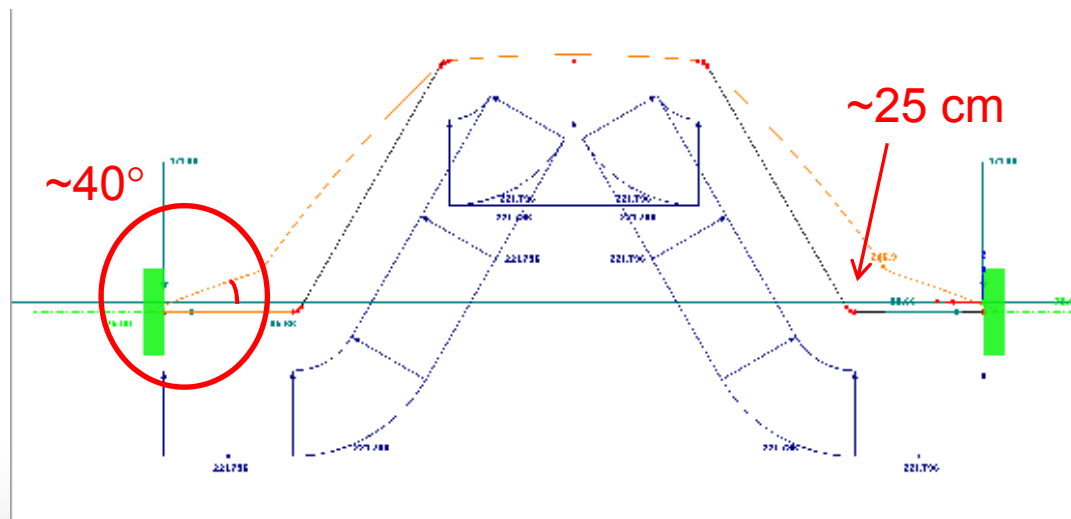
Design Drydock: Pipe-to-pipe wall versus Combiwall

Problem with Combiwall: infilling sheet pile

Earth pressure +
installation tolerance at 18 m depth

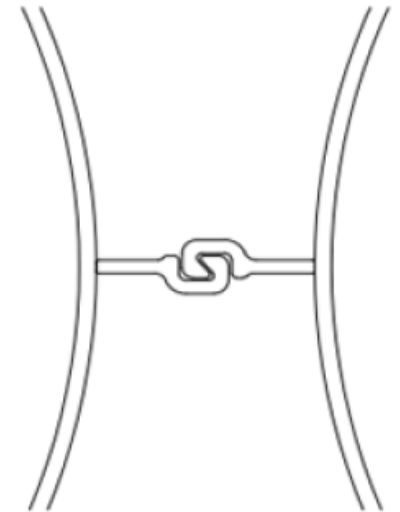
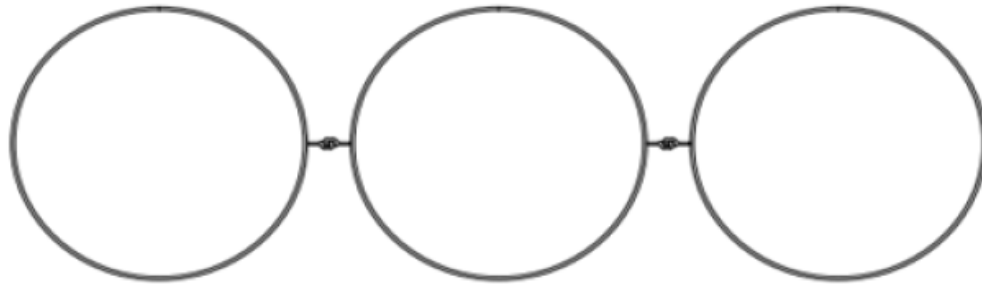


Large deformations



Design Drydock: Pipe-to-pipe wall versus Combiwall

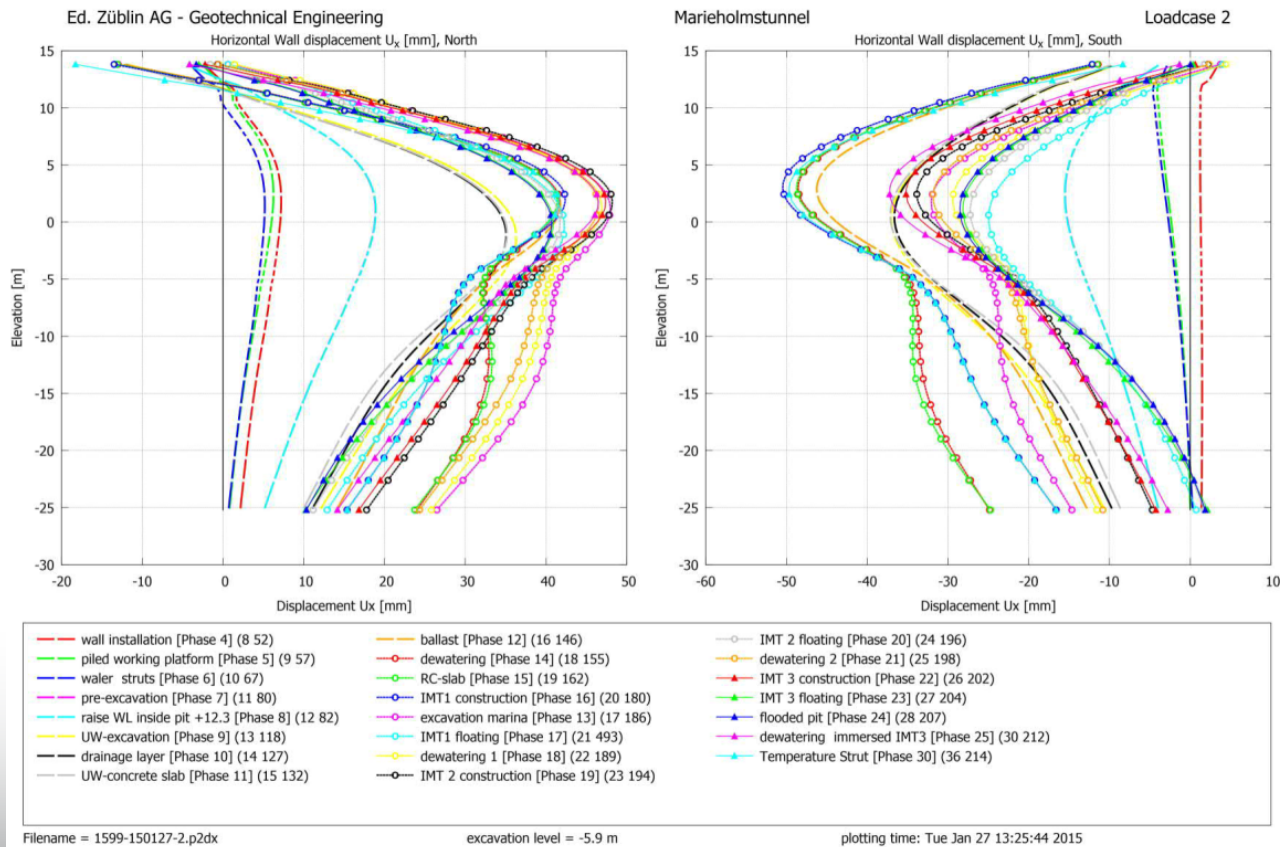
Typical Pipe-to-Pipe-Wall:



Design Drydock: Pipe-to-pipe wall versus Combiwall

Advantage of pipe wall:

- Less deformation: horizontal max ~50 mm

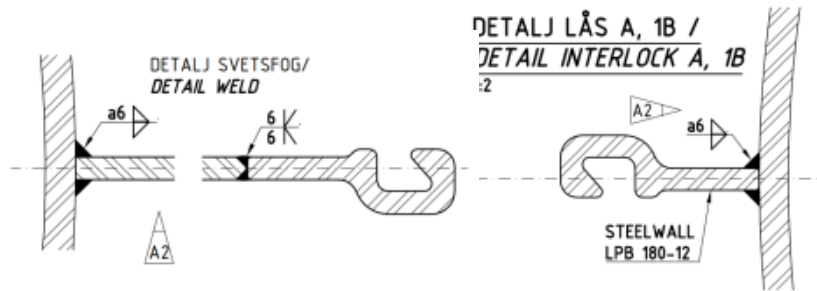


Design Drydock: Pipe-to-pipe wall versus Combiwall

Advantage of pipe wall:

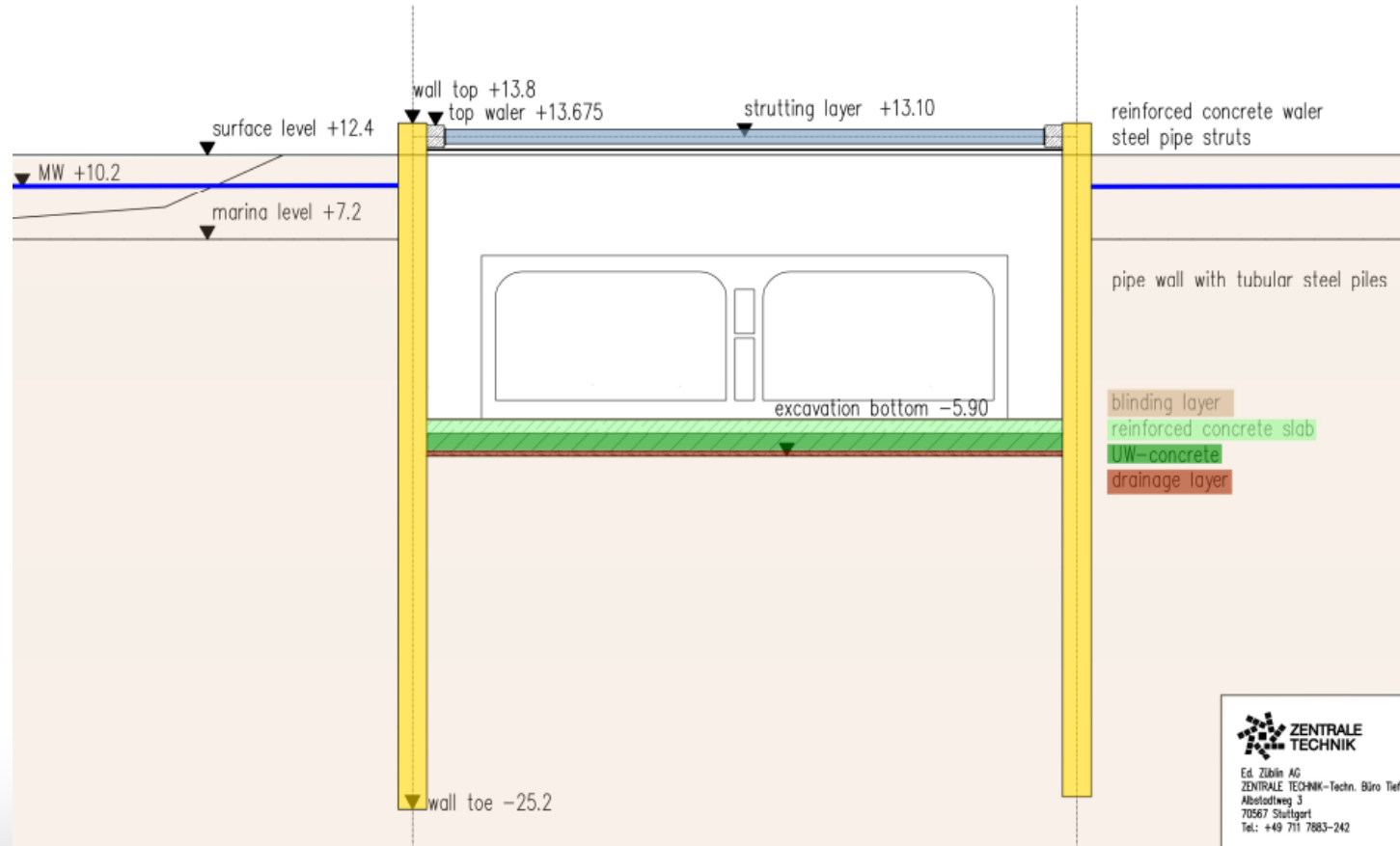
- Less deformation: horizontal max ~50 mm
- Locks only for sealing and guiding, no structural function

Standardlock LPB 180-12



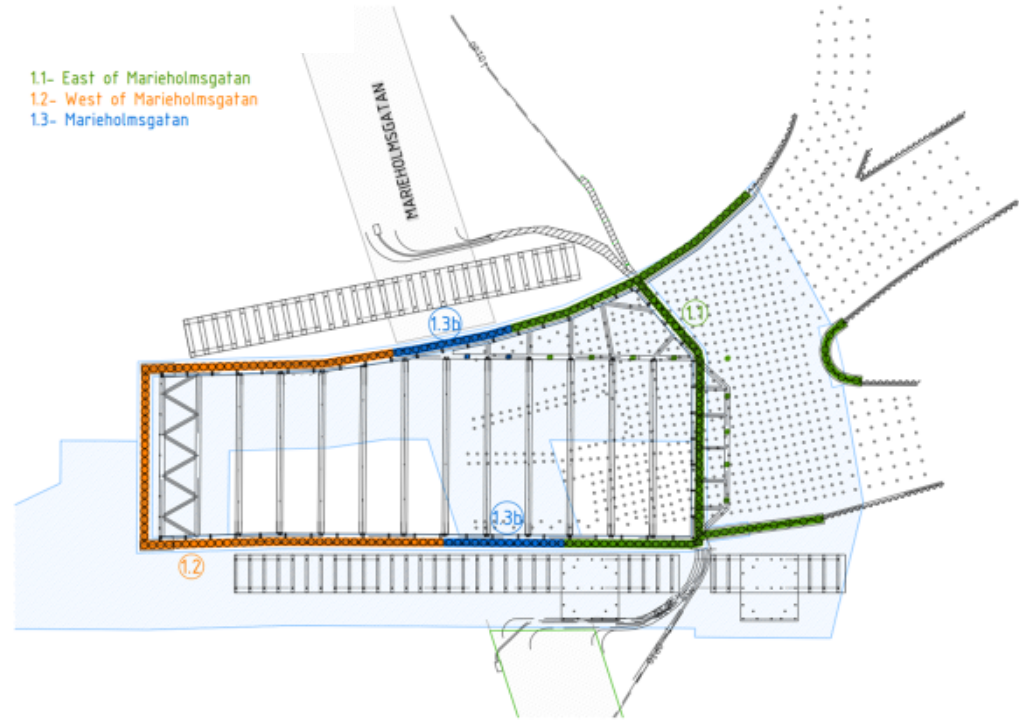
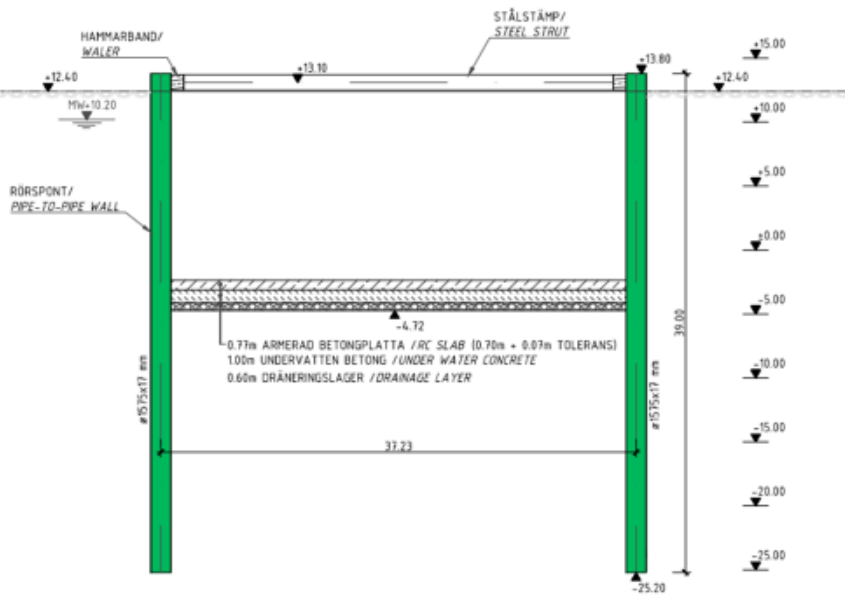
Lock sealing

Typical cross section



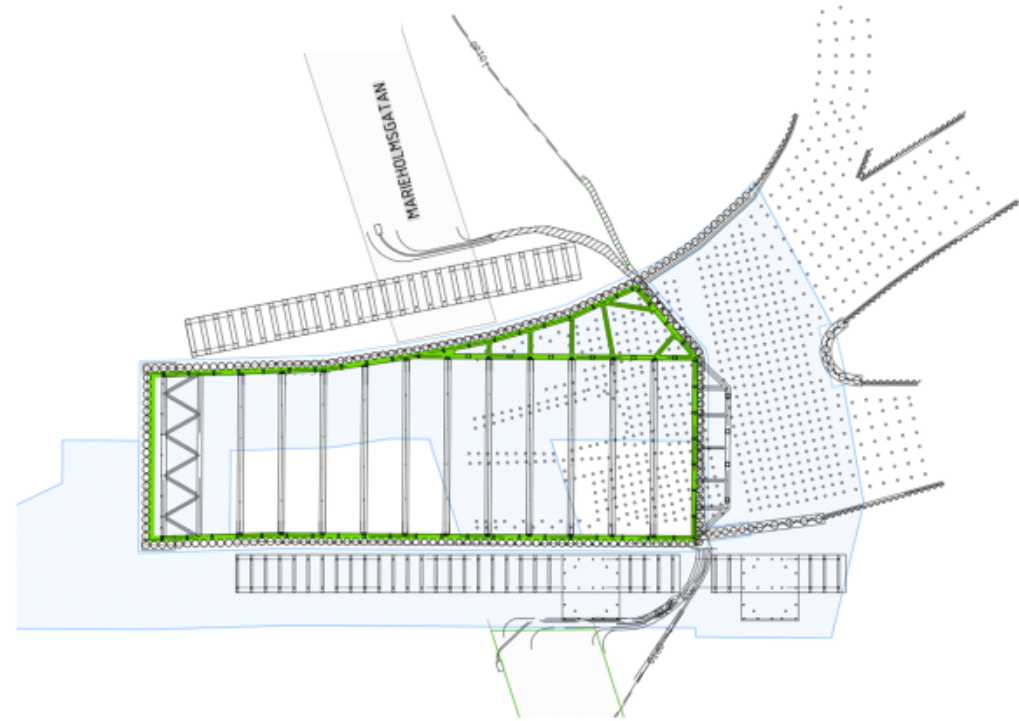
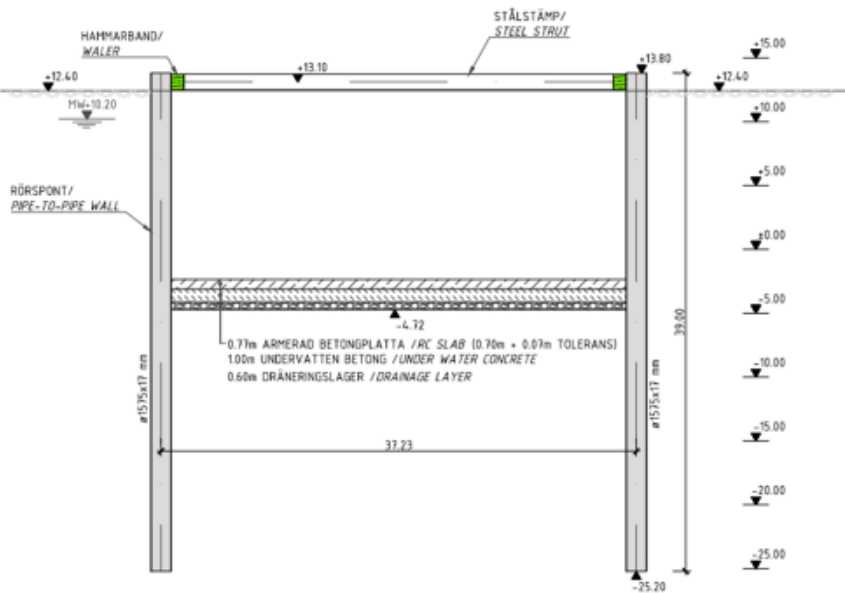
Working sequence

1. Installation of pipe wall



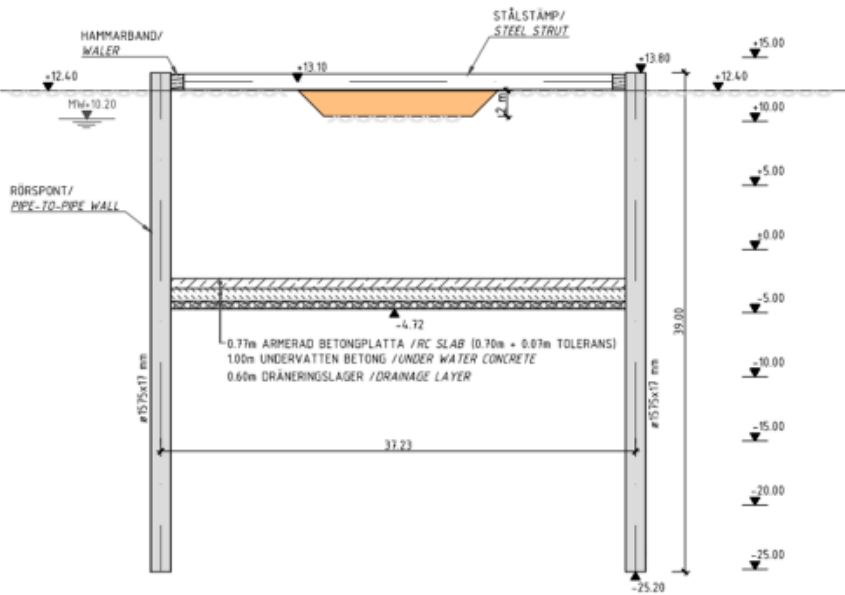
Working sequence

2. Installation of concrete and steel waler

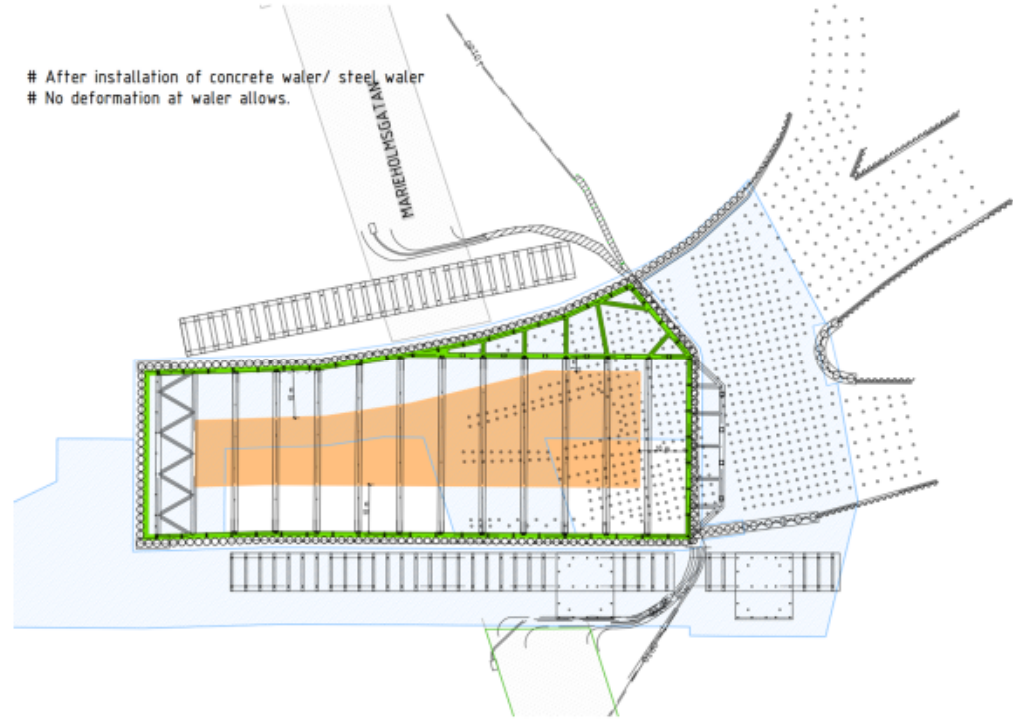


Working sequence

3. Dry preexcavation

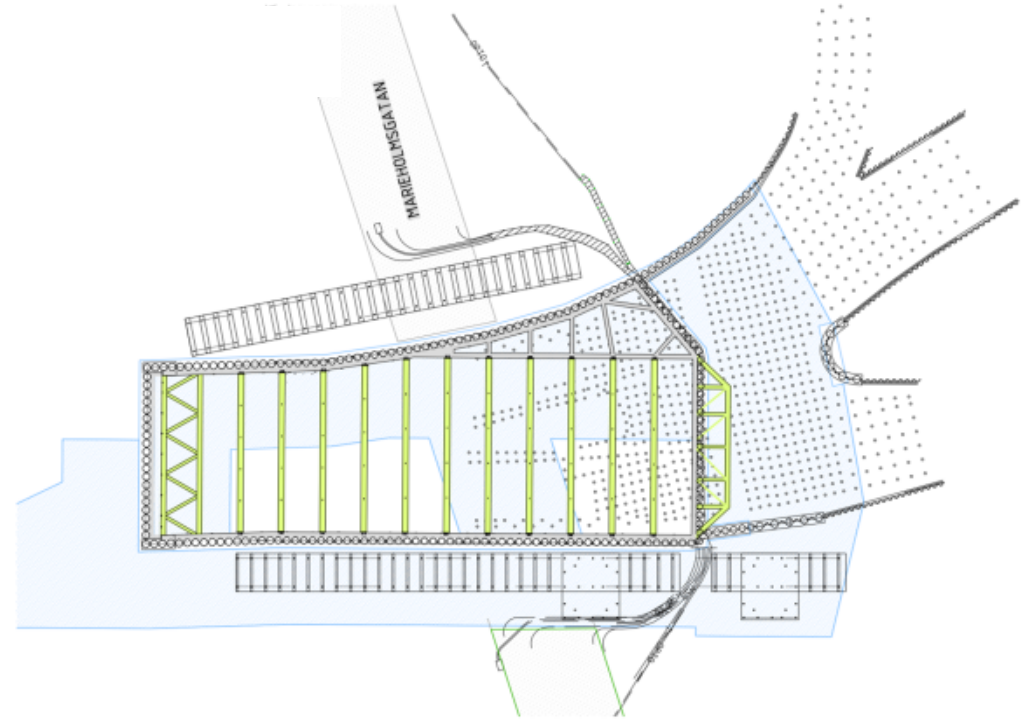
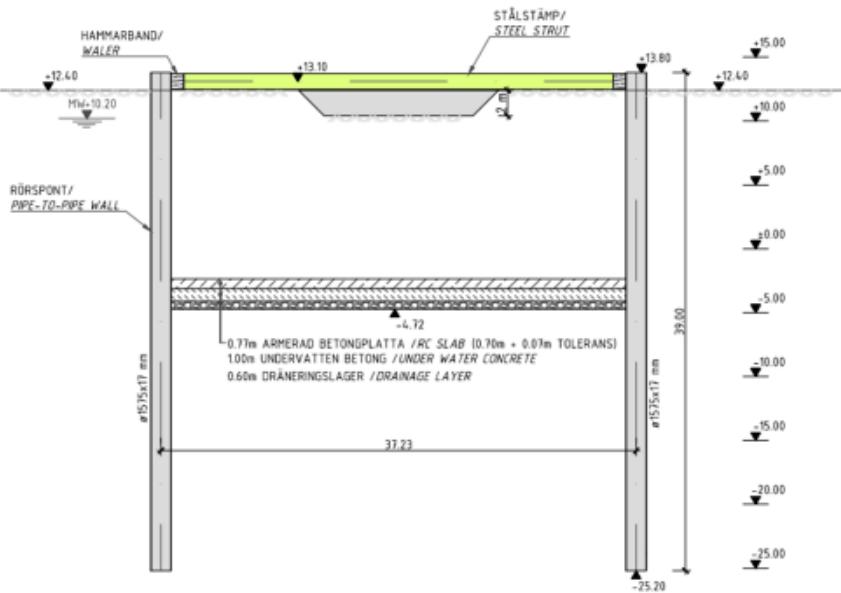


After installation of concrete waler/ steel waler
 # No deformation at water allows.



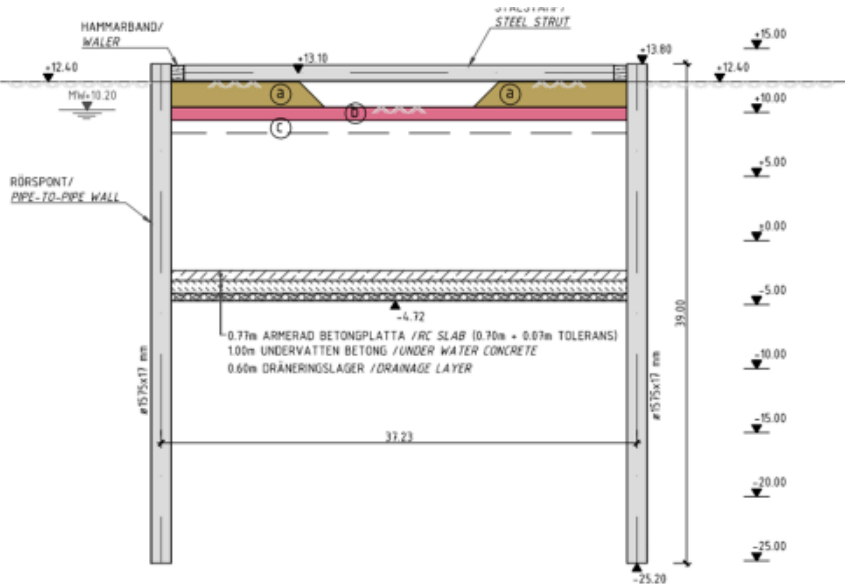
Working sequence

4. Installation of struts



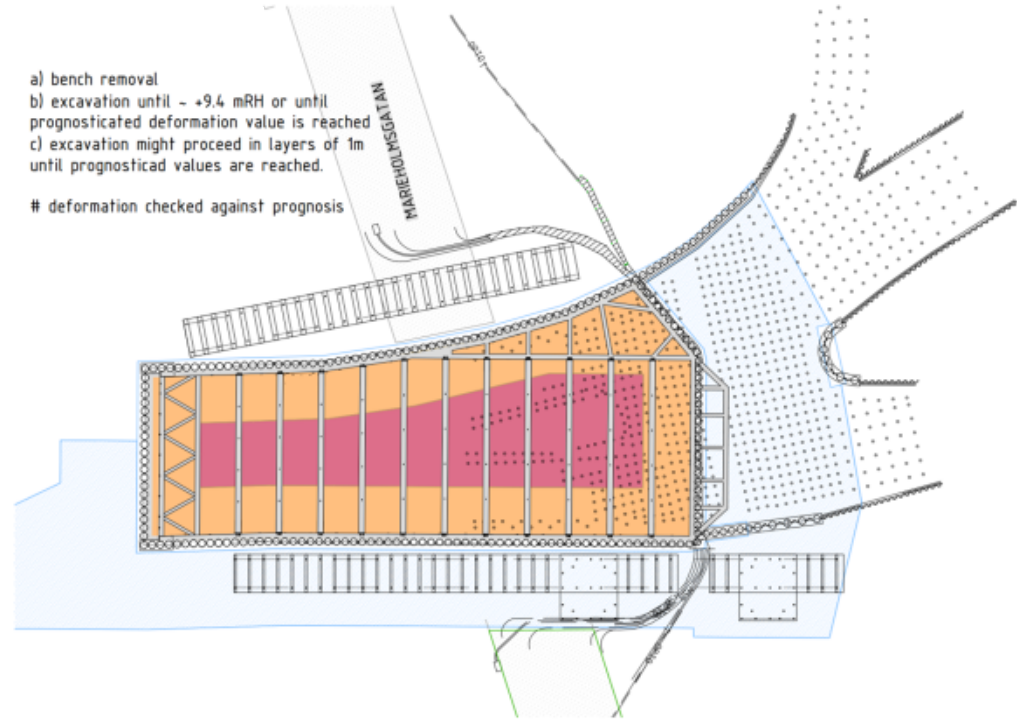
Working sequence

5. Dry excavation



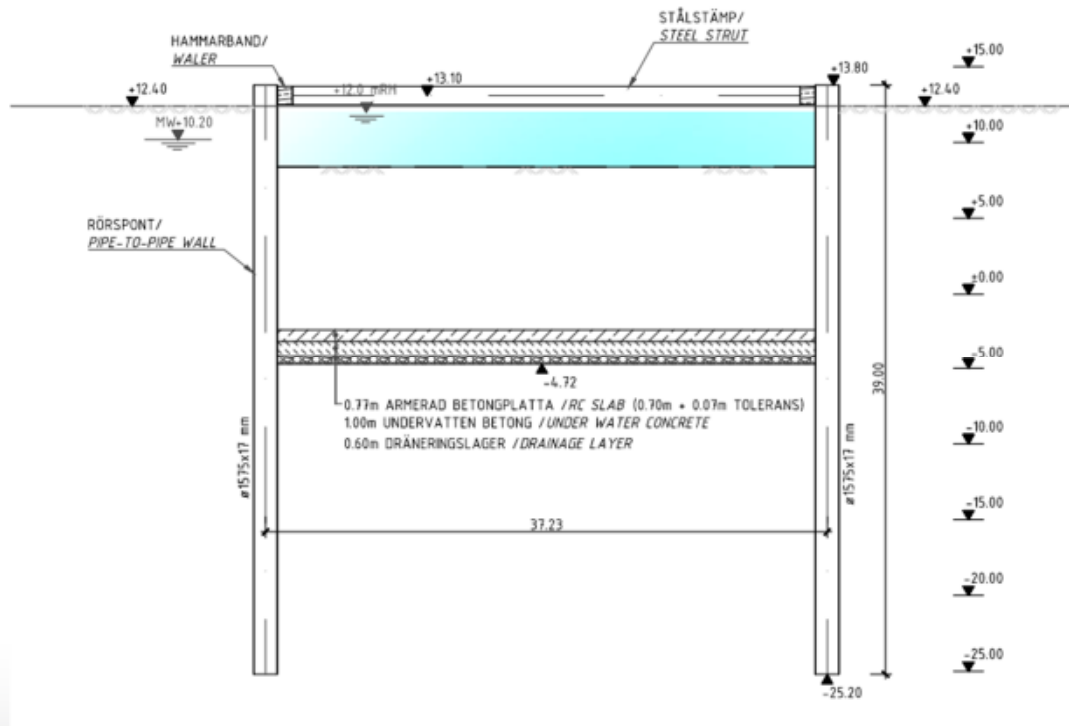
- a) bench removal
- b) excavation until - +9.4 mRH or until prognosticated deformation value is reached
- c) excavation might proceed in layers of 1m until prognosticated values are reached.

deformation checked against prognosis



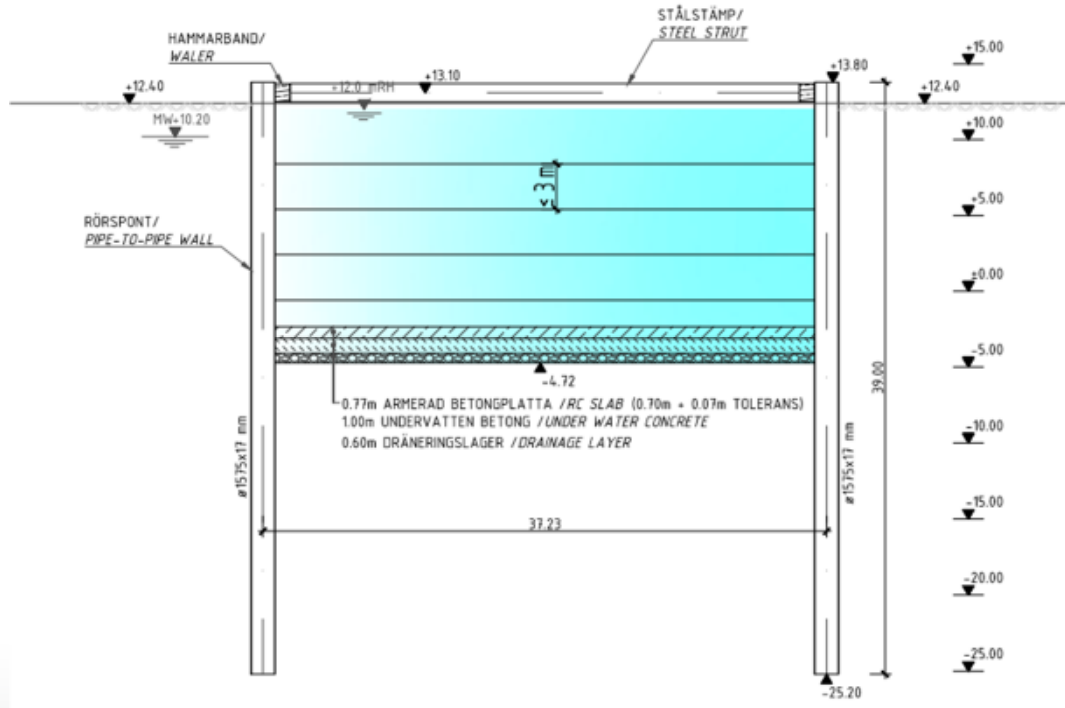
Working sequence

6. Flooding of pit up to +12,0 mRH



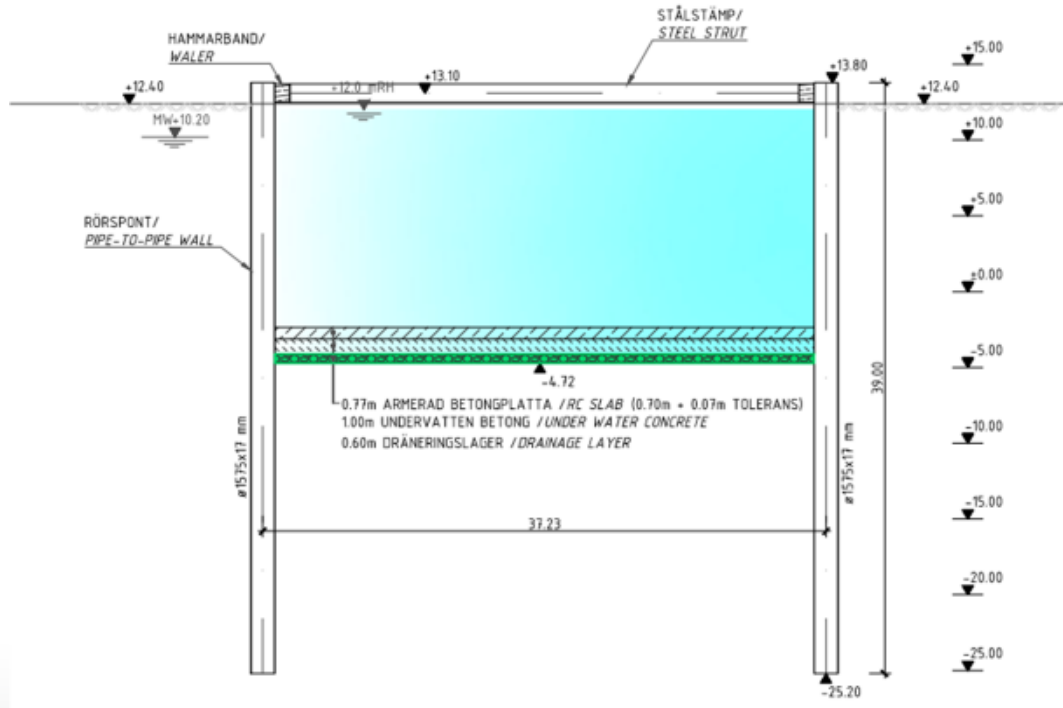
Working sequence

7. Wet excavation in steps of 3m



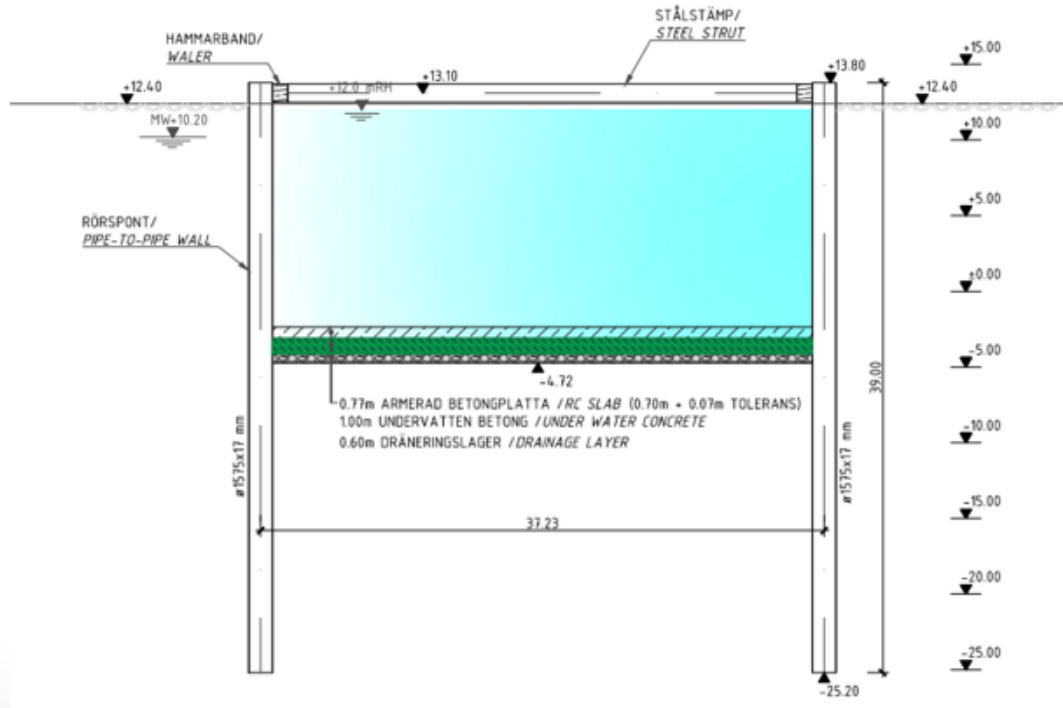
Working sequence

8. Installation of drainage layer with min thickness 0,4 m



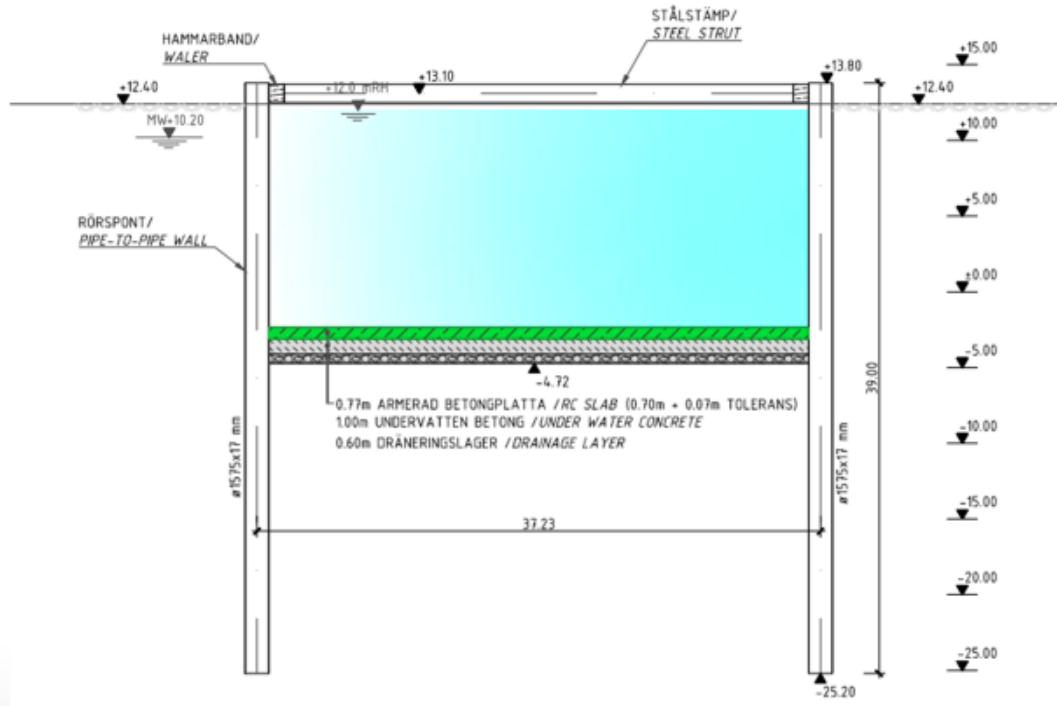
Working sequence

9. Casting of underwater concrete slab with thickness 1,1 m



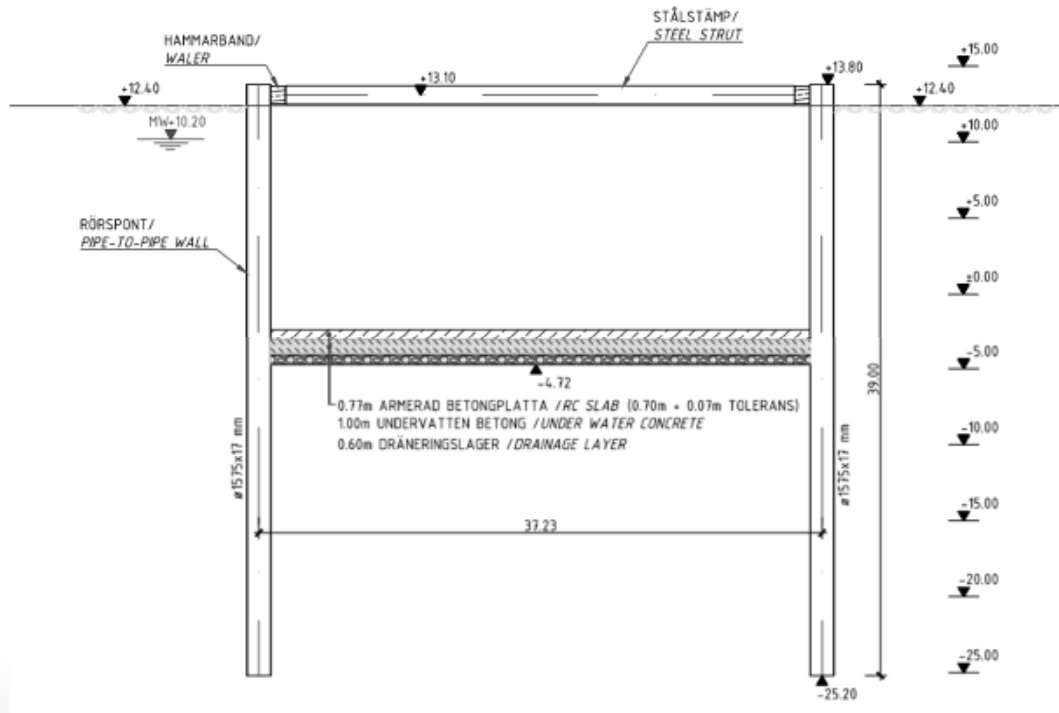
Working sequence

10. Placing of ballast material with thickness 1,0 m



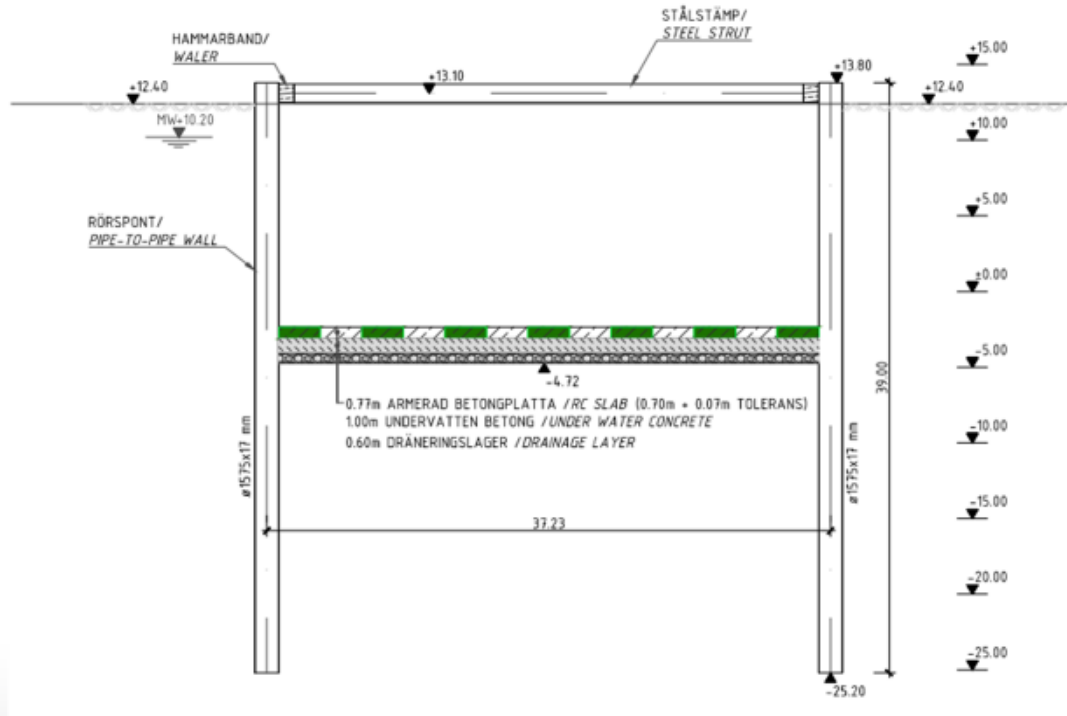
Working sequence

10. Dewatering of pit

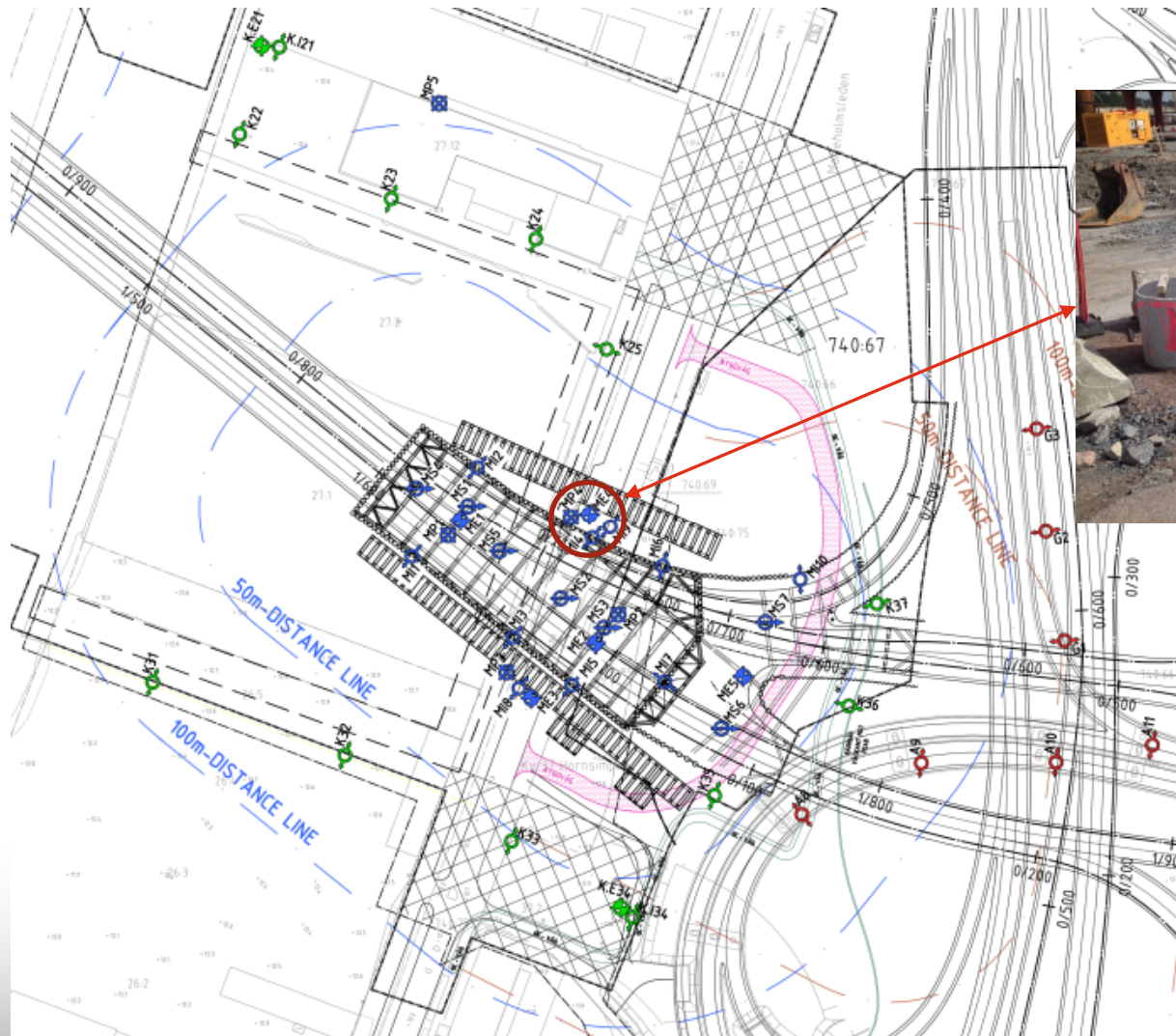


Working sequence

10. Casting of reinforced concrete slab replacing the ballast material in crosswise strips of 5 m



Geomonitoring



- ◆ EXTENSOMETER
- ◆ EXTENSOMETER (CONSTRUCTION PITS)
- VW PIEZOMETER (CONSTRUCTION PITS)
- ⊗ STRUT FORCES (STRAIN GAUGES)
- ⊕ INCLINOMETER: ALREADY INSTALLED, ONLY MEASUREMENT (PARTIHALLSBRIDGE)
- ⊕ INCLINOMETER: INSTALLATION AND MEASUREMENT (CONSTRUCTION SITE)
- ⊕ INCLINOMETER: INSTALLATION AND MEASUREMENT (CONSTRUCTION PITS)

Geomonitoring



Browser tabs: Marieholmstunneln - Trafi... | Live - Züblin Scandinavia AB | Solexperts AG [WebDAVIS ...]

Address bar: Solexperts AG (CH) | <https://webdavis.solexperts.com/a2398marieholms/>

SOLEXPERTS WEBDAVIS 3.0 MARIEHOLMST

Home View Help

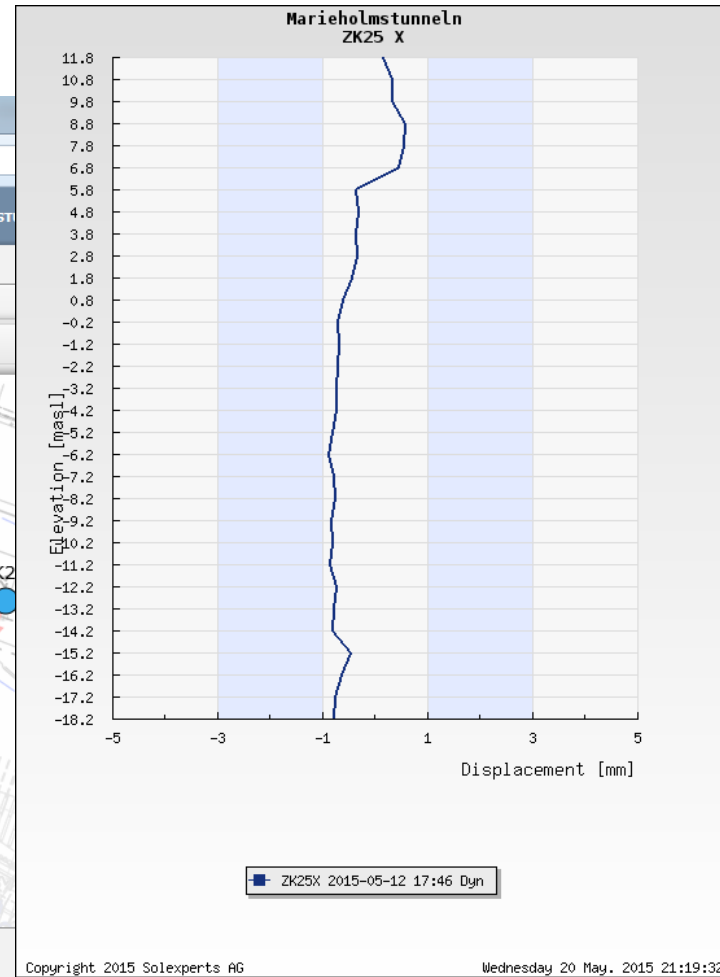
Maps Image gallery Plot tool Download area Log book Settings

Maps / Views View area Print View

- Home
- Overview
- Marieholms
 - Marieholms Pit
 - Surrounding**
 - ServiceValues

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SOLEXPERTS TRAFIKVERKET ZÜBLIN Booklets



Working area Drydock



Installation pipe-to-pipe-wall



INTRODUCTION

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DRYDOCK
DESIGN

DRYDOCK
Execution



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Details pipe-to-pipe-wall



Details pipe-to-pipe-wall



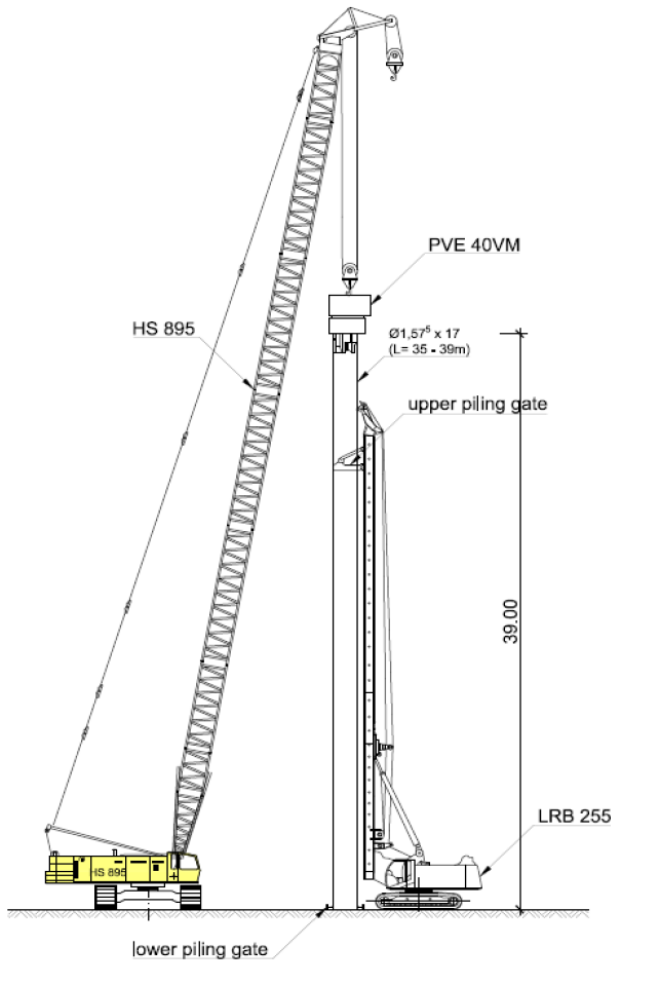
Guiding of pipe during installation



Guiding of pipe during installation



Crane set up for installation



Status of pipe during installation





Browser tabs: Marieholmstunneln - Trafi... Live - Züblin Scandinavia AB

Address bar: zueblin.se/sv/live/

Search: Suchen

ZÜBLIN

OM OSS

TJÄNSTER

AKTUELLA PROJEKT

REFERENSOBJEKT

INFORMATION TILL VÅRA LEVERANTÖRER


JOBB & KARRIÄR

KONTAKTA OSS


☎ Kontakt | Hem

Marieholmstunneln Live


2015-05-20 21:35:09
Marieh schakt PRO



2015-05-20 21:33:14
Marieh front



Var finns vi



NYHETER

30 March 2015 - 16:17
5000 besökare under Söderström
Söndagen den 29:e mars 2015 var det dags för Citybanans öppet hus igen. Den här gången visades sänktunneln i Riddarfjärden upp för första gången för allmänheten. Intresset var stort och runt 5000 personer trotsade regn och rus...

13 February 2015 - 14:04
LAVA - Arbetsmarknadsmässa på KTH
LAVA - Arbetsmarknadsdag på KTH den 12:e februari 2015 Züblin Scandinavia AB var med på LAVA, arbetsmarknadsdagen som hölls på Kungliga Tekniska Högskolan den 12:e februari. I år deltog 106 företag inom

