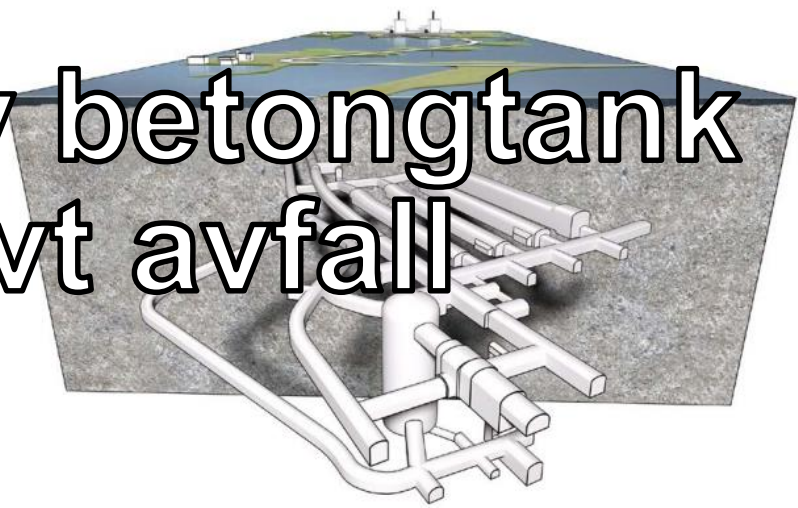


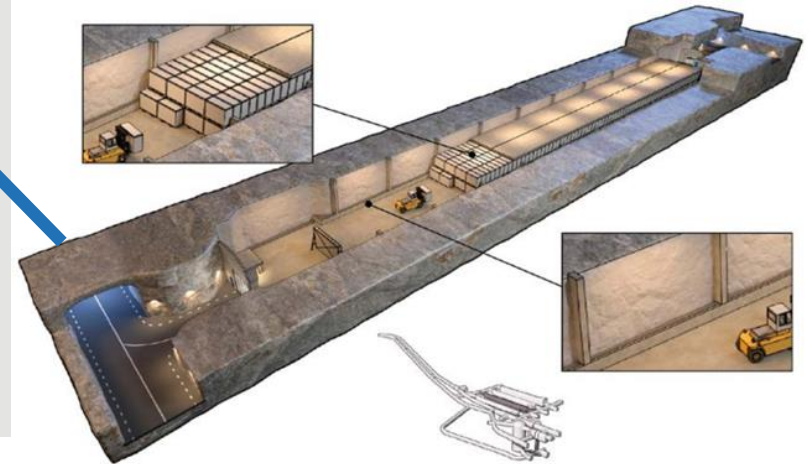
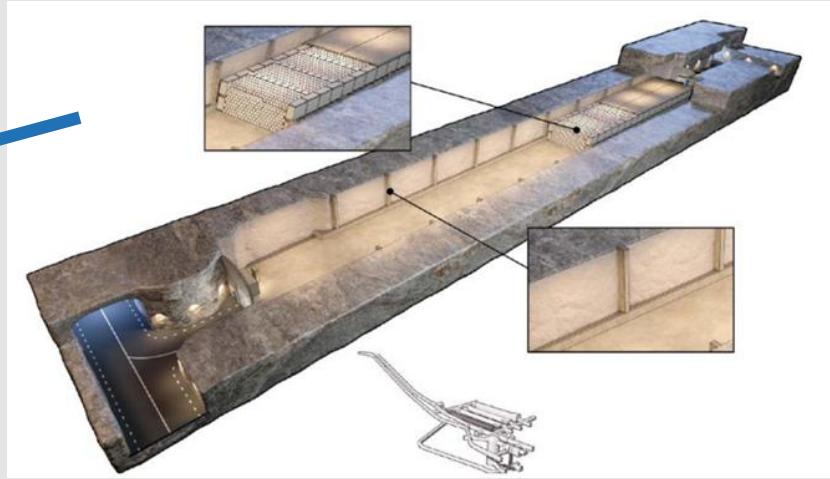
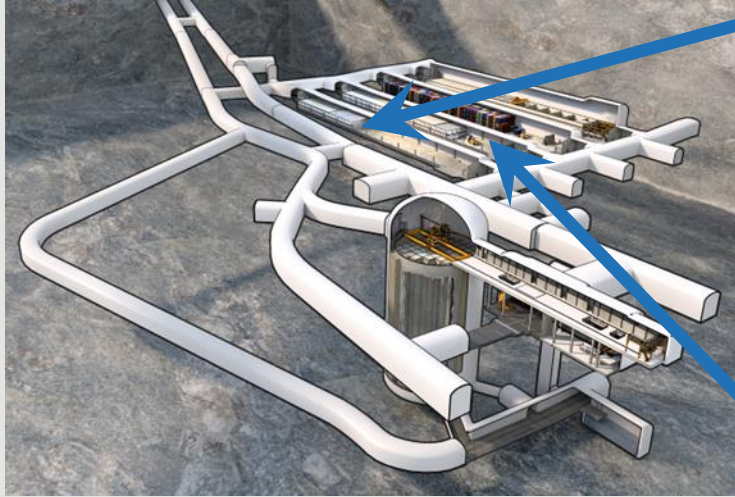


Tryckprovning av betongtank för radioaktivt avfall

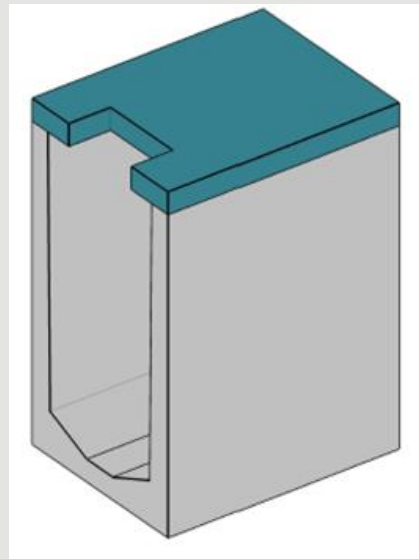
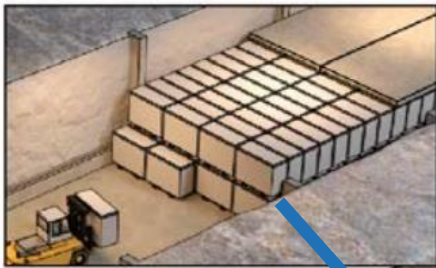
Peter Lundqvist – Vattenfall AB
Kraftindustrins betongdag 2024



SFR



Betongtanken



L X H X B = 3300 x 2140 x 1300

t = 150 mm

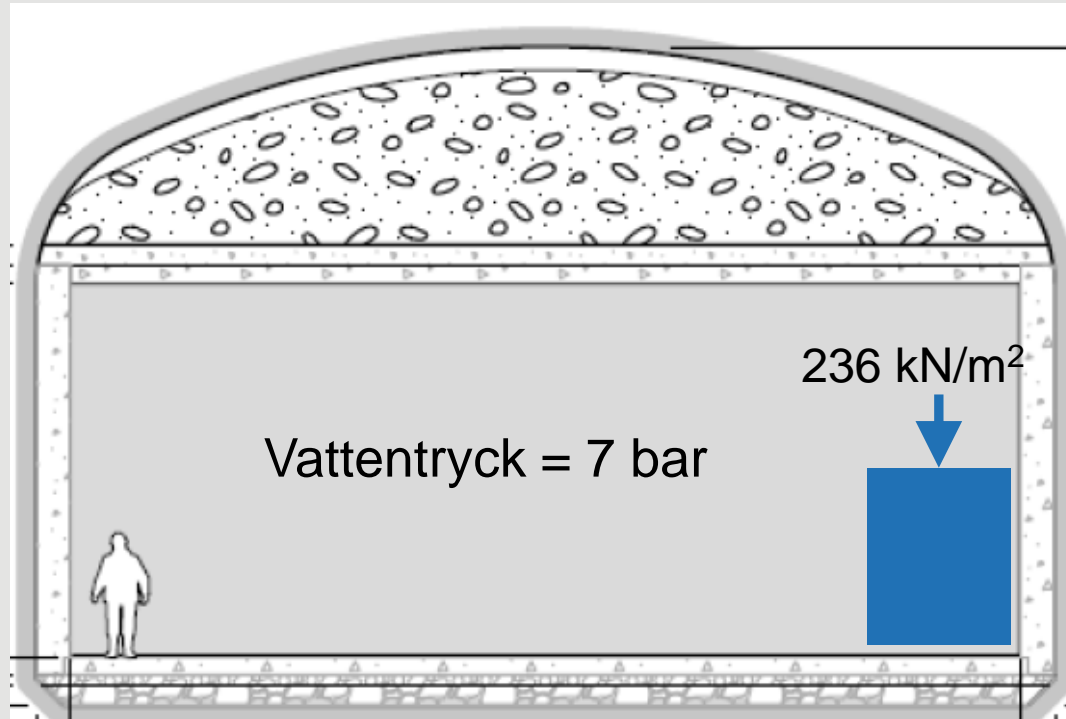
Vikt tom = 10 t

Vikt full = 20 t

Betong: C30/37

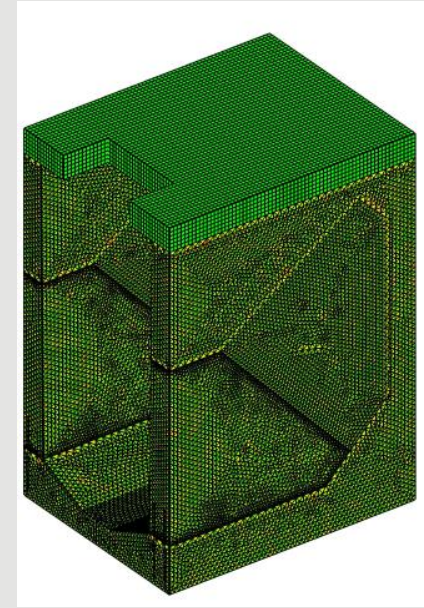
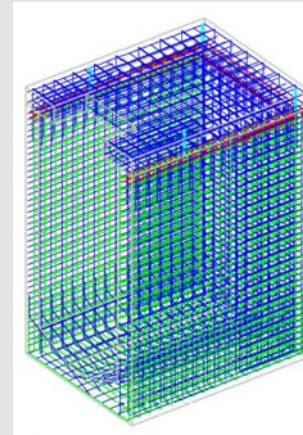
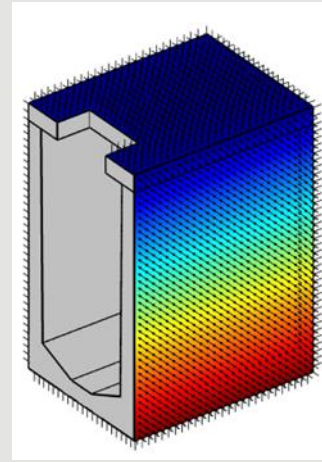
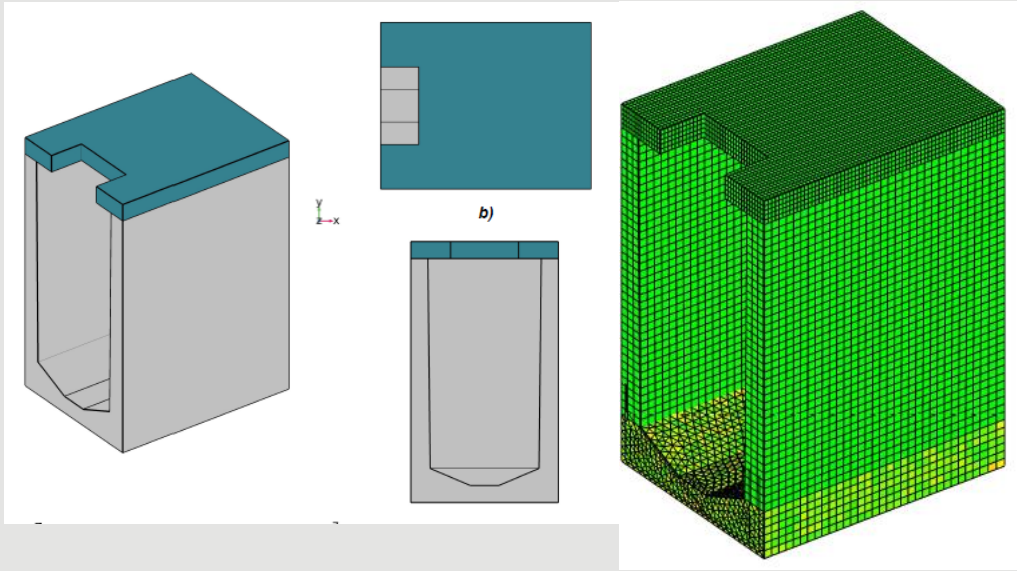
Armering: K500AB, K600B

Betongtankens integritet efter förslutning

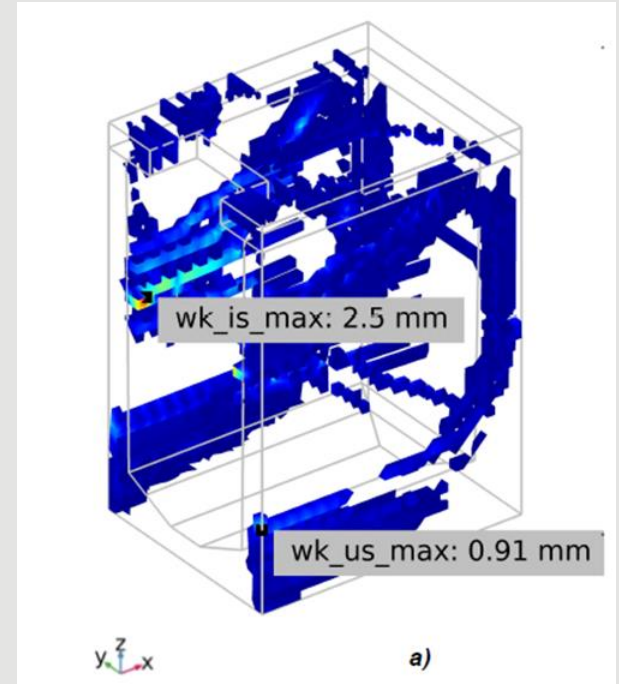
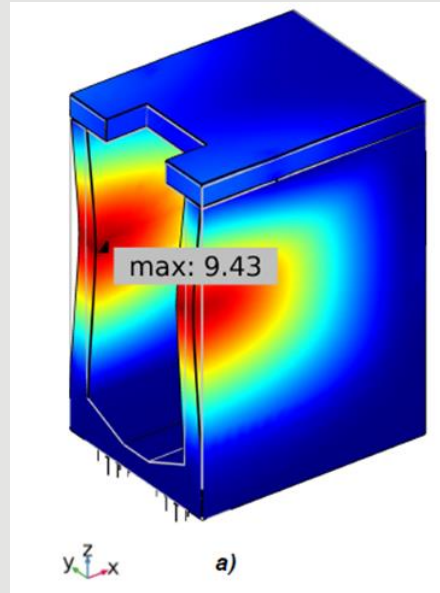
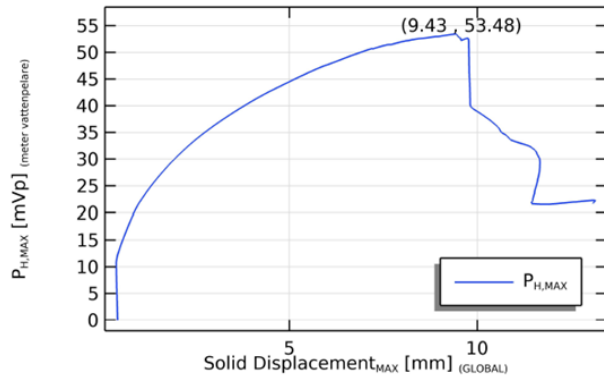


Numeriska analyser

1. Icke-linjär FE-analys.
2. Diskret sprickmodell.

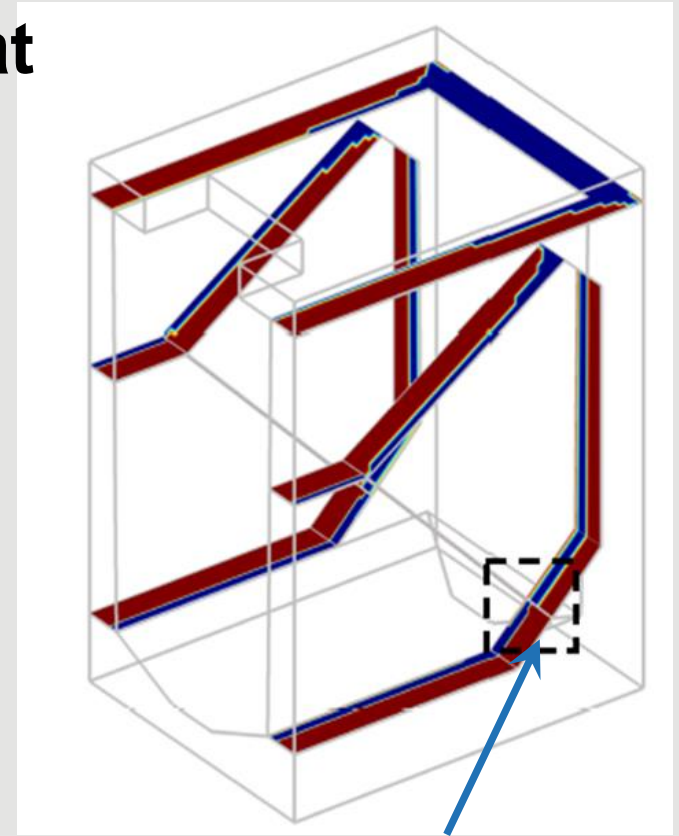
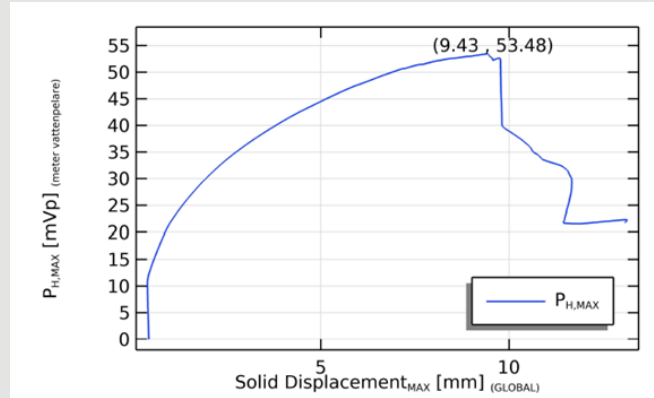


Numeriska analyser



Numeriska analyser - resultat

- Vattenförande sprickor: 10-20 mVP,
- Vattentäthet förloras: 35-45 mVP.
- Genomgående sprickor: vattenfyllnad 15–20 mVP
- Maximal last: 53,5 mVP,



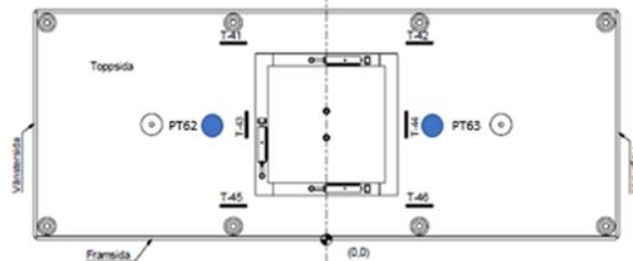
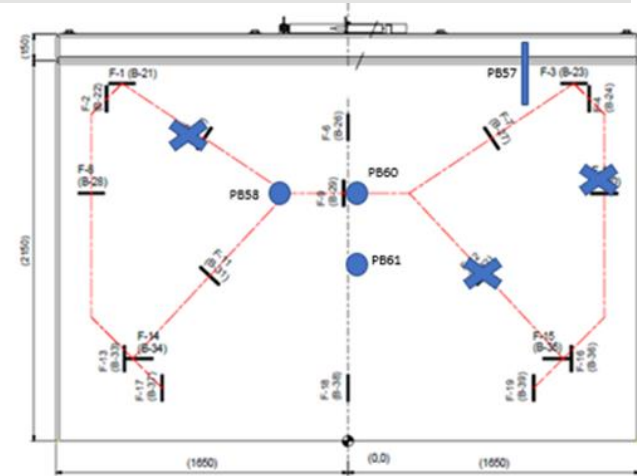
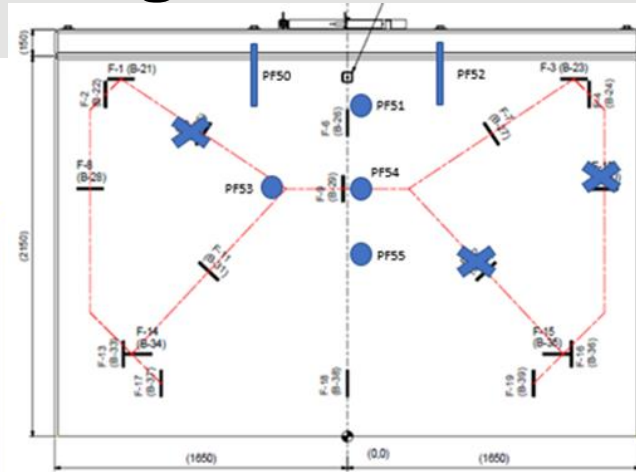
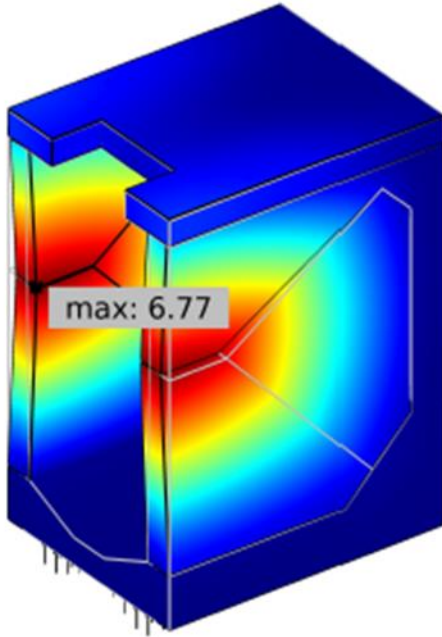
Flöde vid 17 mVP bar ($w > 0,01$ mm)

Tryckprovning

- Kockums trycktank ”Jumbotanken”
- 160 bar hydrostatiskt tryck

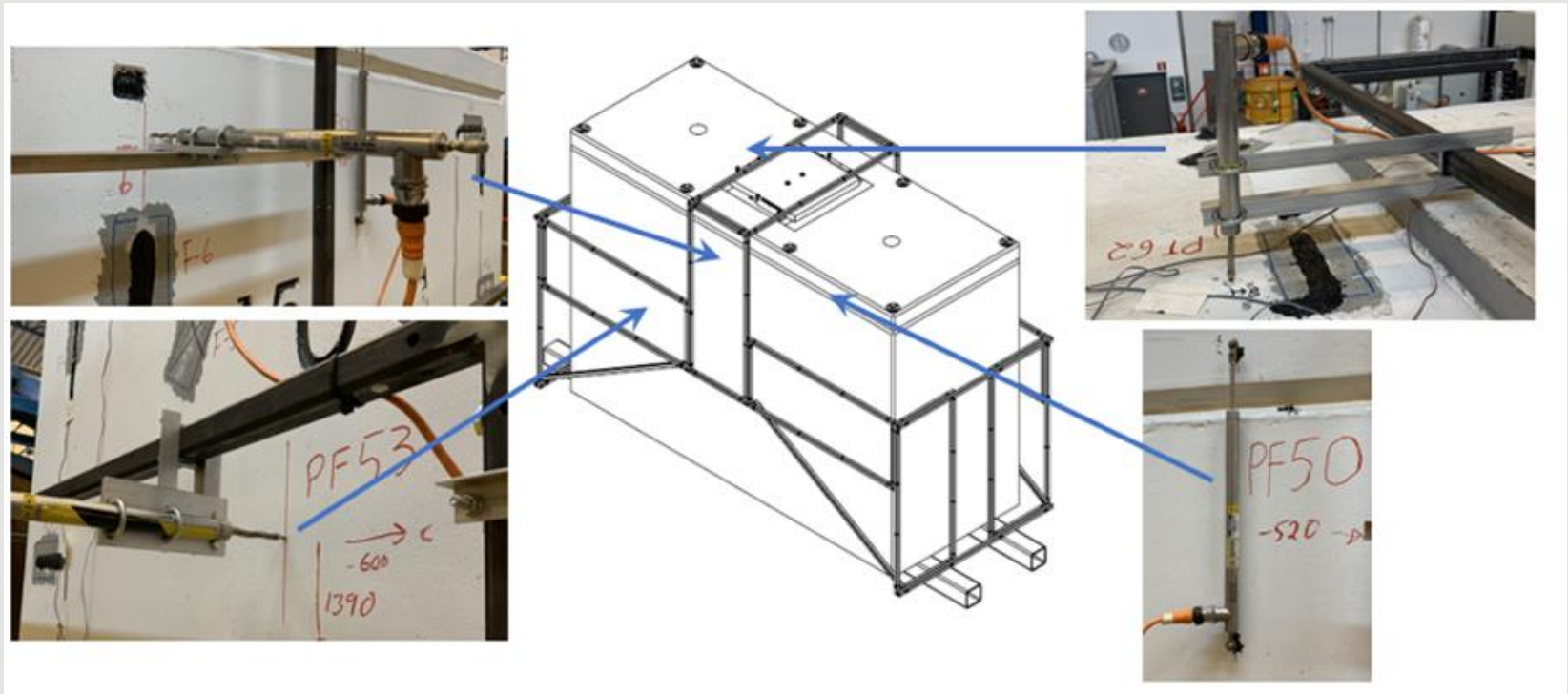


Instrumentering

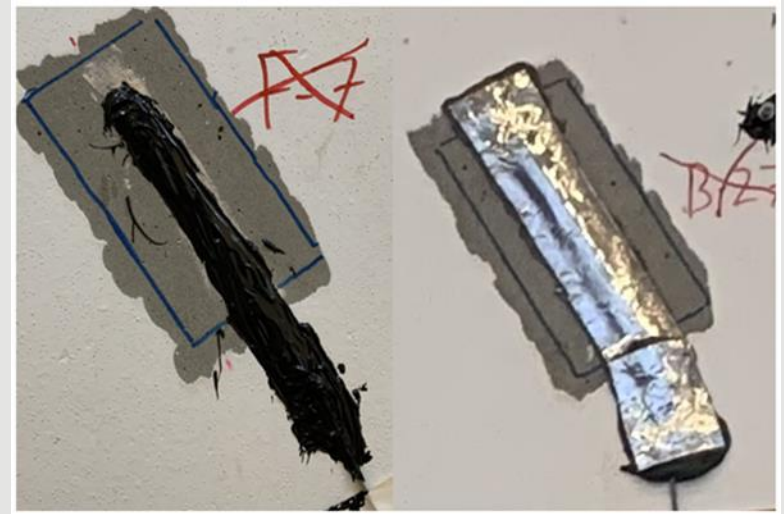
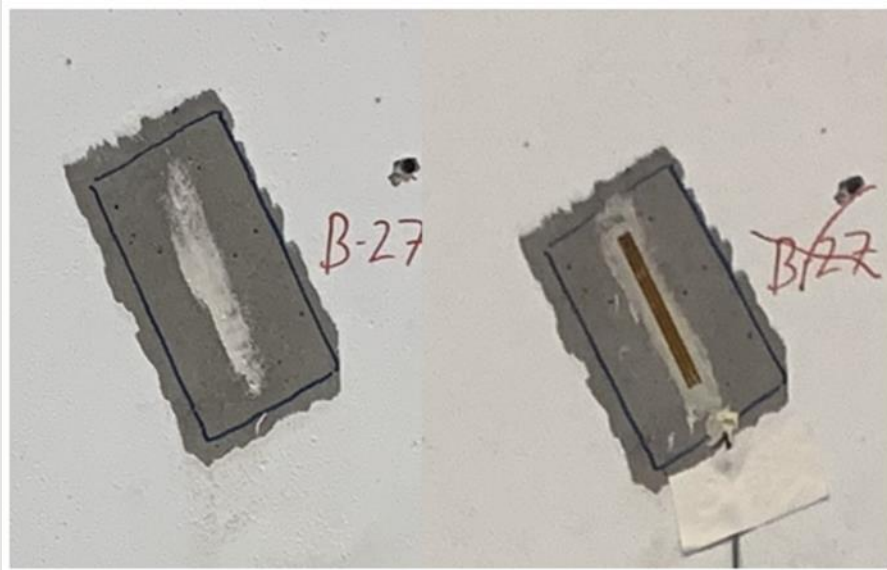


- Läsesgivare
- Läsesgivare som mäter rörelser mellan vägg och betonglock
- Trådtöjningsgivare
- ✕ Trådtöjningsgivare som inte monterades

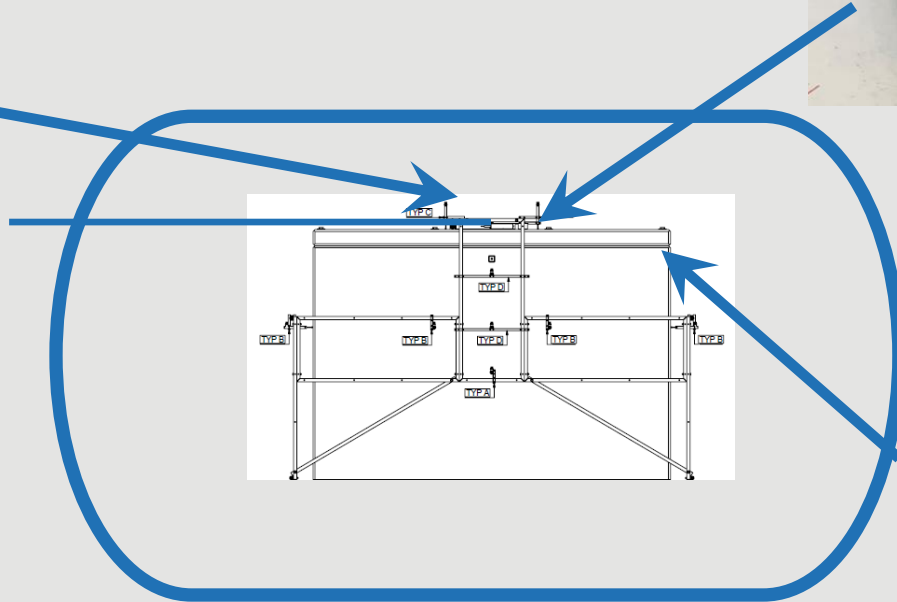
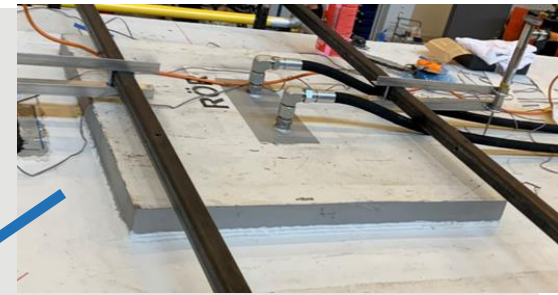
Instrumentering - lägesgivare



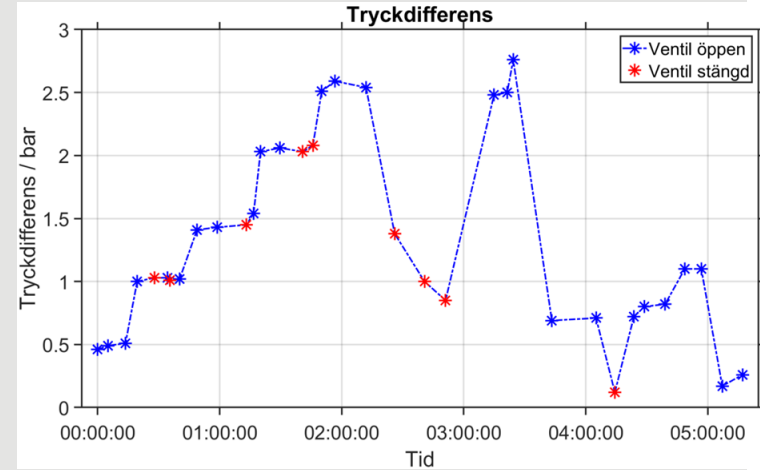
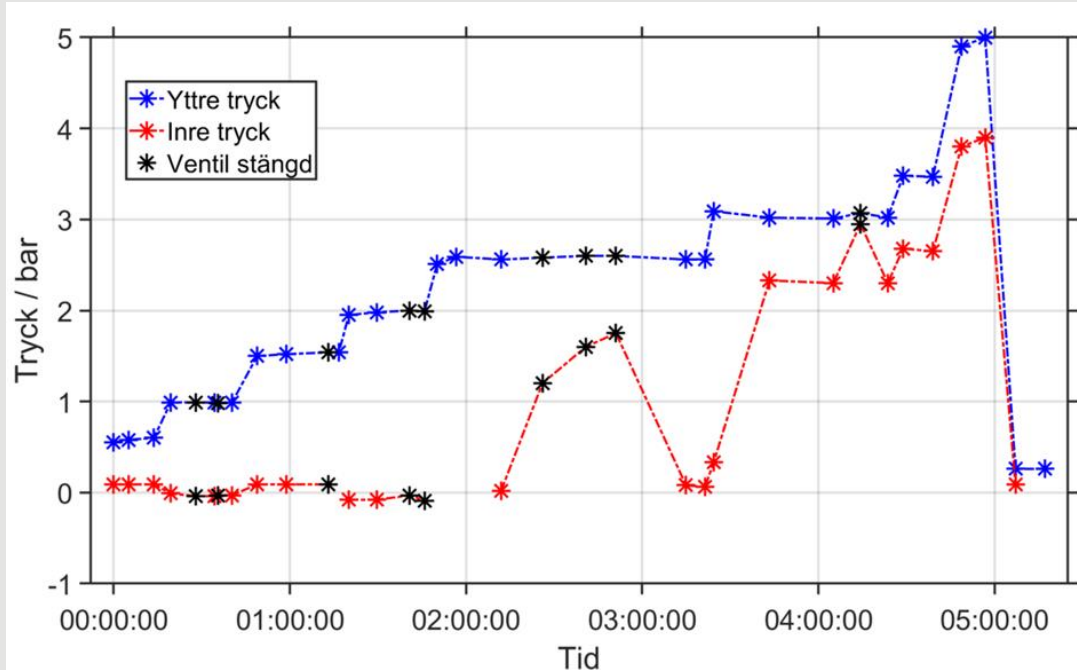
Instrumentering - trådtöjningsgivare



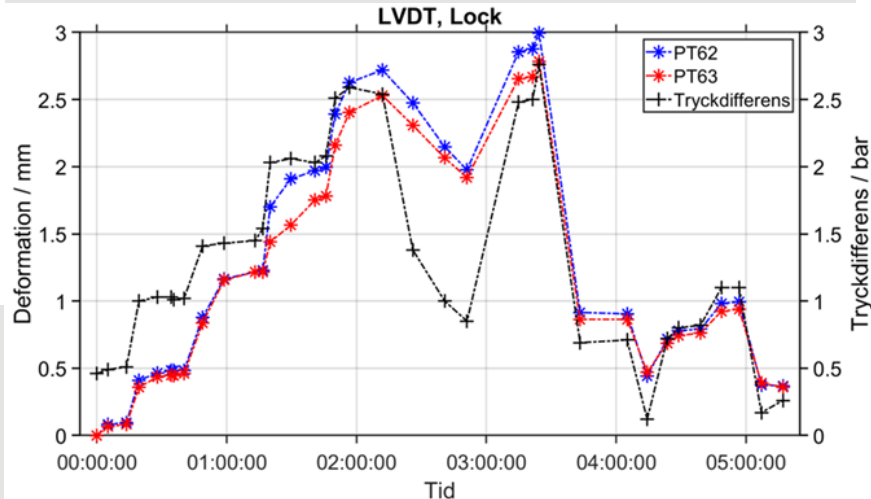
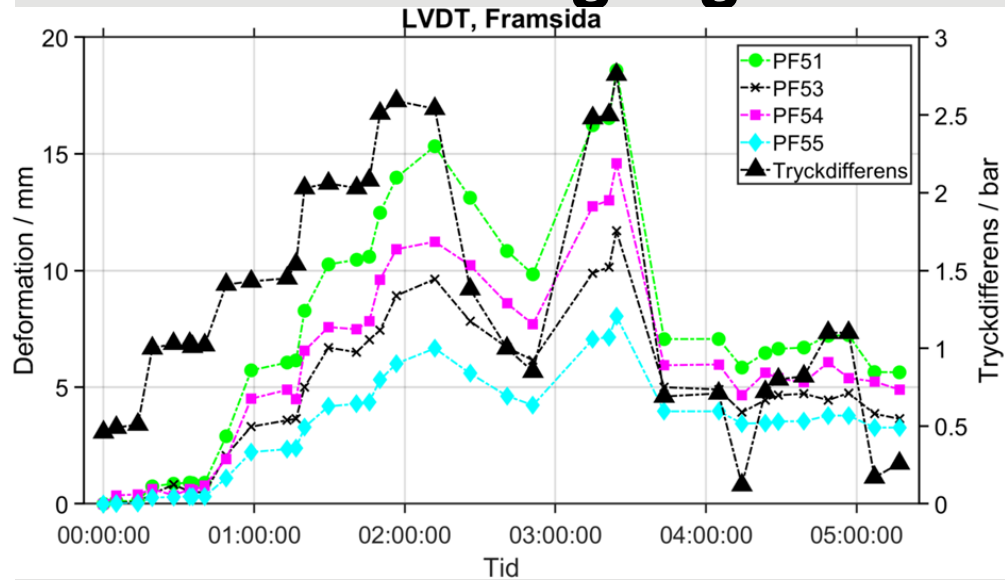
Tryckprovning



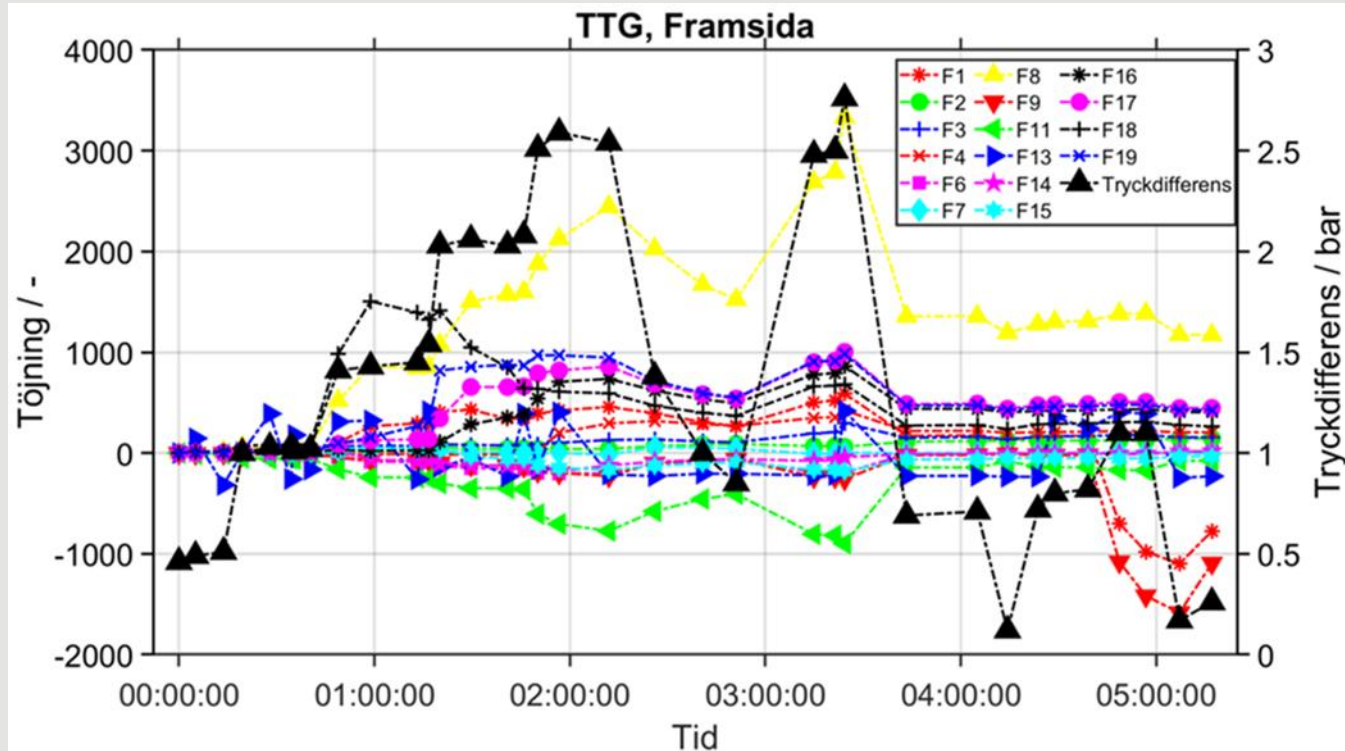
Provningen



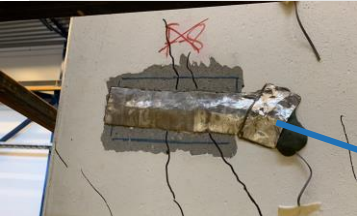
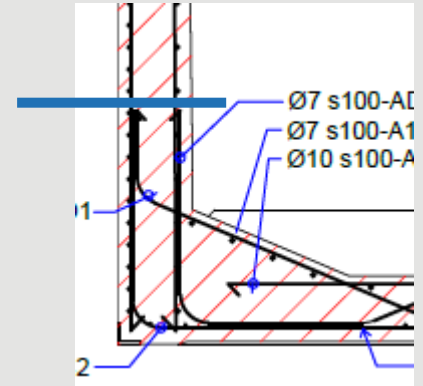
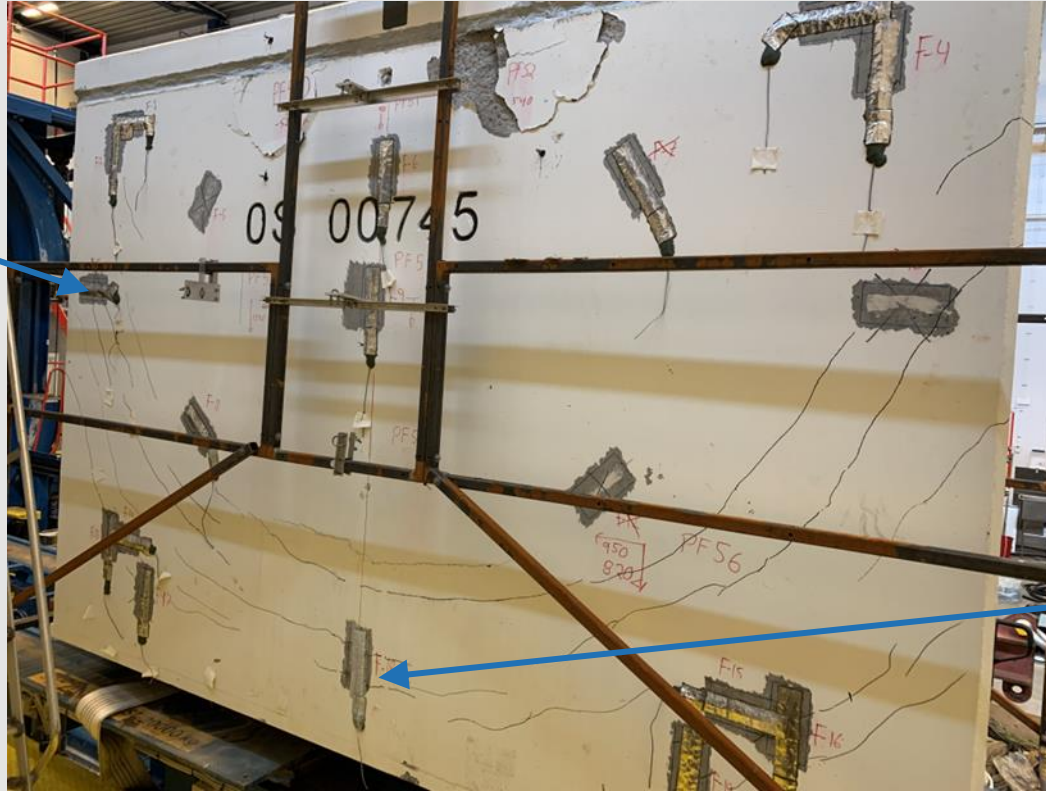
Resultat - lägesgivare



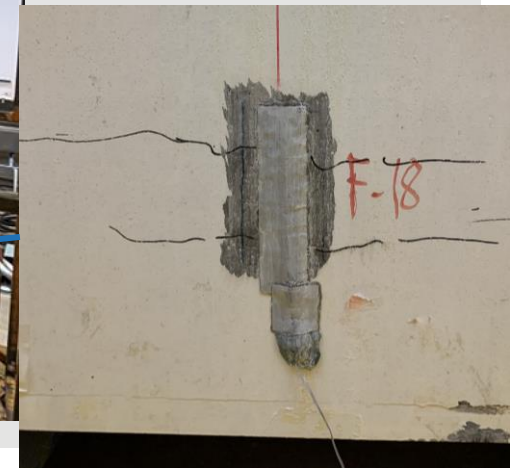
Resultat - trådtöjningsgivare



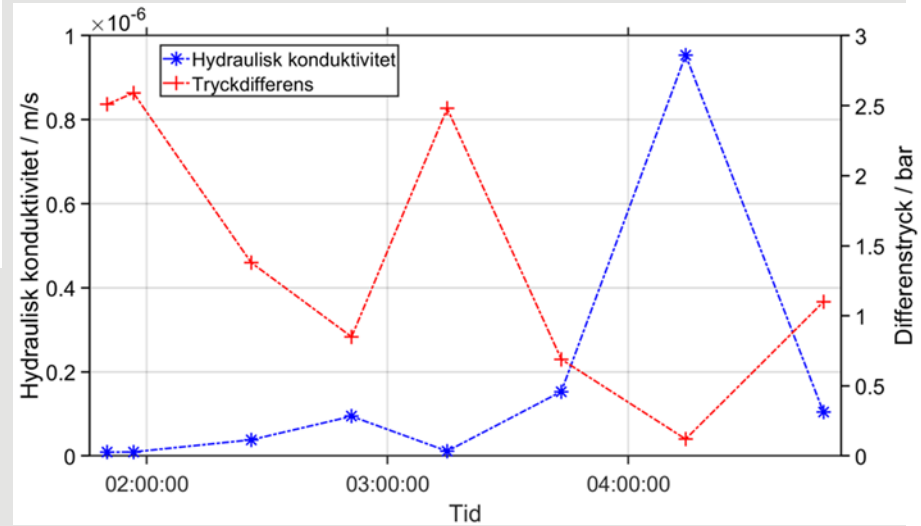
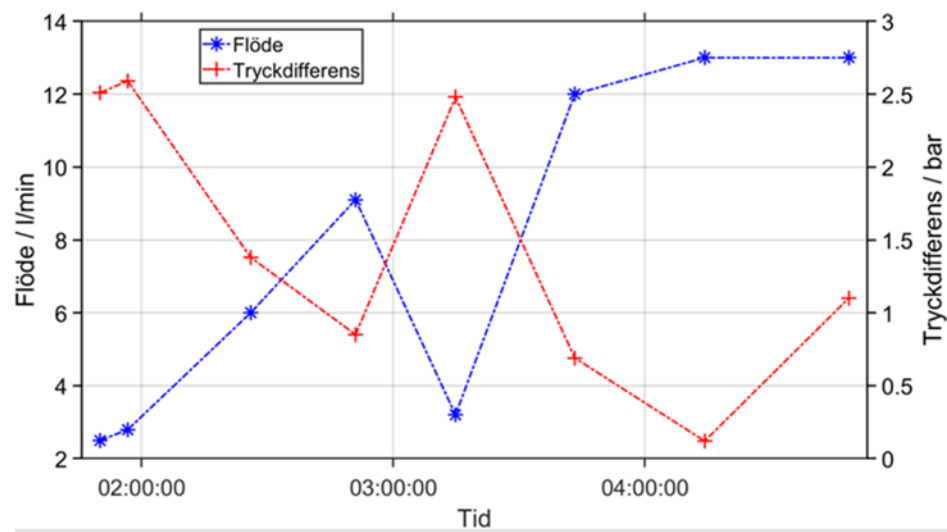
Sprickor



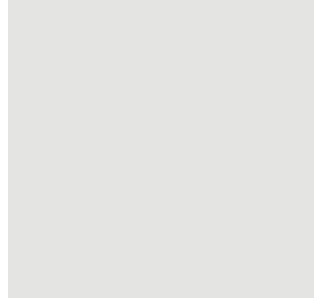
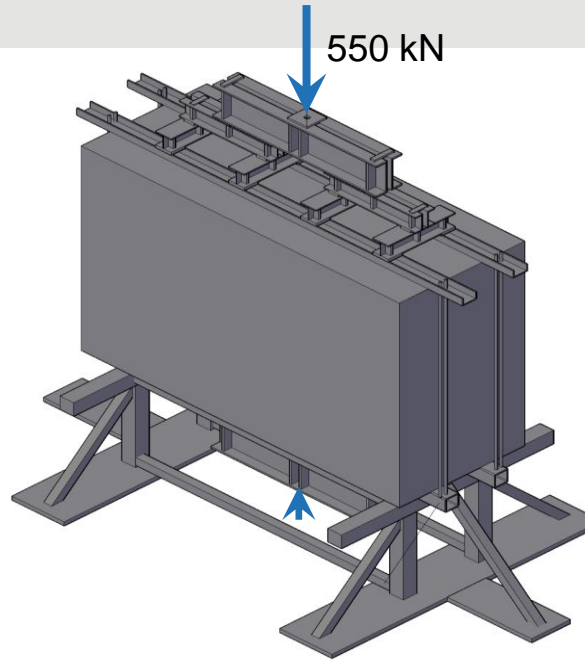
0,33 mm



Flöden

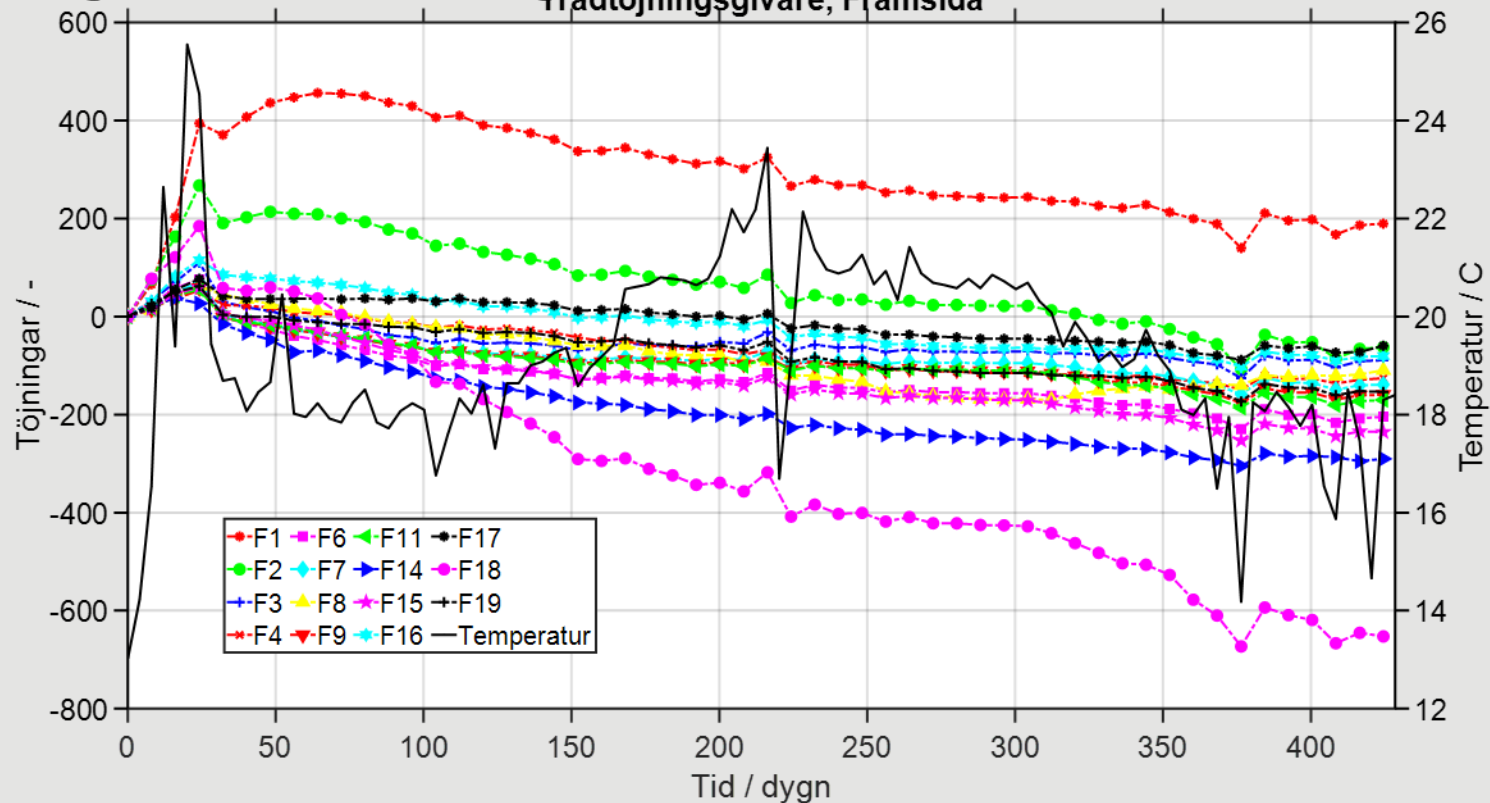


Långtidsprovning



Långtidsprovning - mätresultat

Trådtöjningsgivare, Framsida



Slutsatser

- Elastiskt beteende tills integriteten gick förlorad vid 2,8 bars tryckskillnad.
- Omfattande sprickbildning med vattenförande sprickor.
- Uppmätta töjningar visar att armeringen inte uppnått flyttöjning.
- Belastningen är lägre än betongtankens bärförmåga.
- Provningsen visade att betongtanken klarar förhållandena efter förslutning.

SLUT!