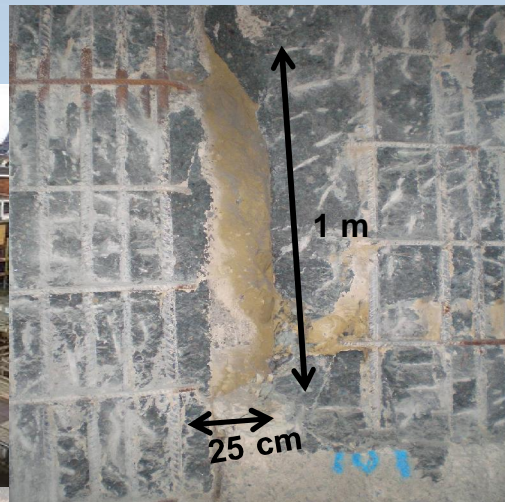




Diepwanden: Bewezen techniek?

2008: **Lekkages**
Amsterdam Vijzelgracht
Noord-zuidlijn



Stromingsproces:
Beton vervangt bentoniet

Belangrijke factoren:

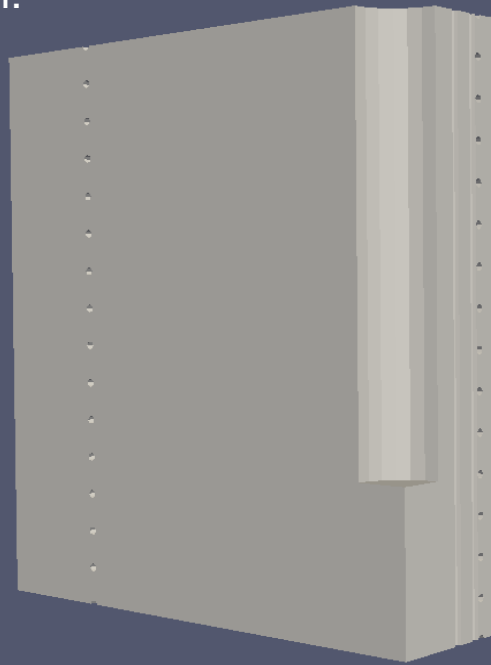
Vloeibaarheid en volumegewicht

- Beton
- Bentoniet

Geometrie

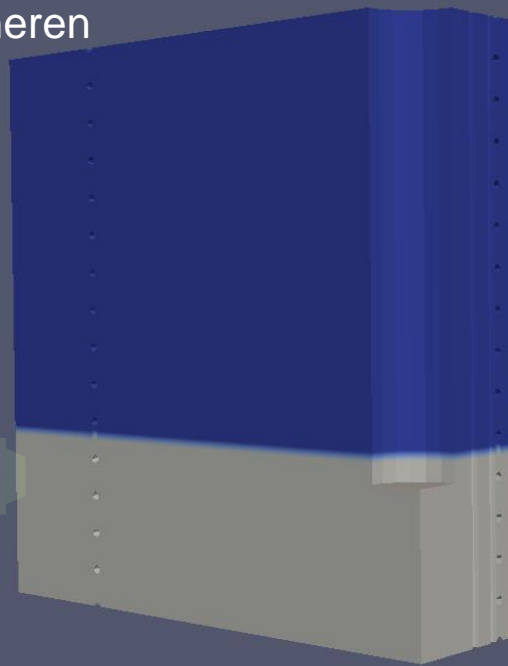
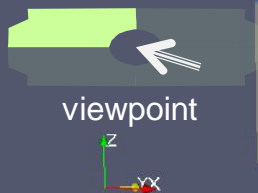
- Sleuf
- Wapeningskorf
- ..

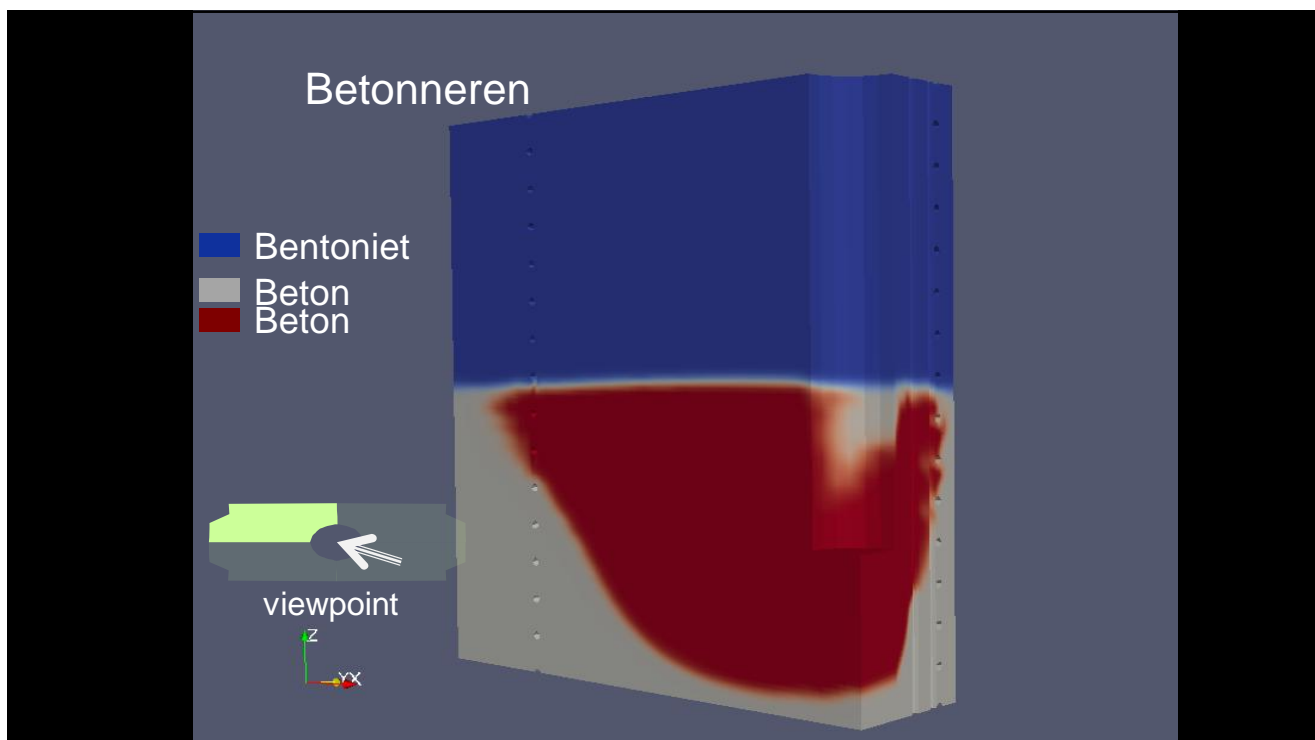
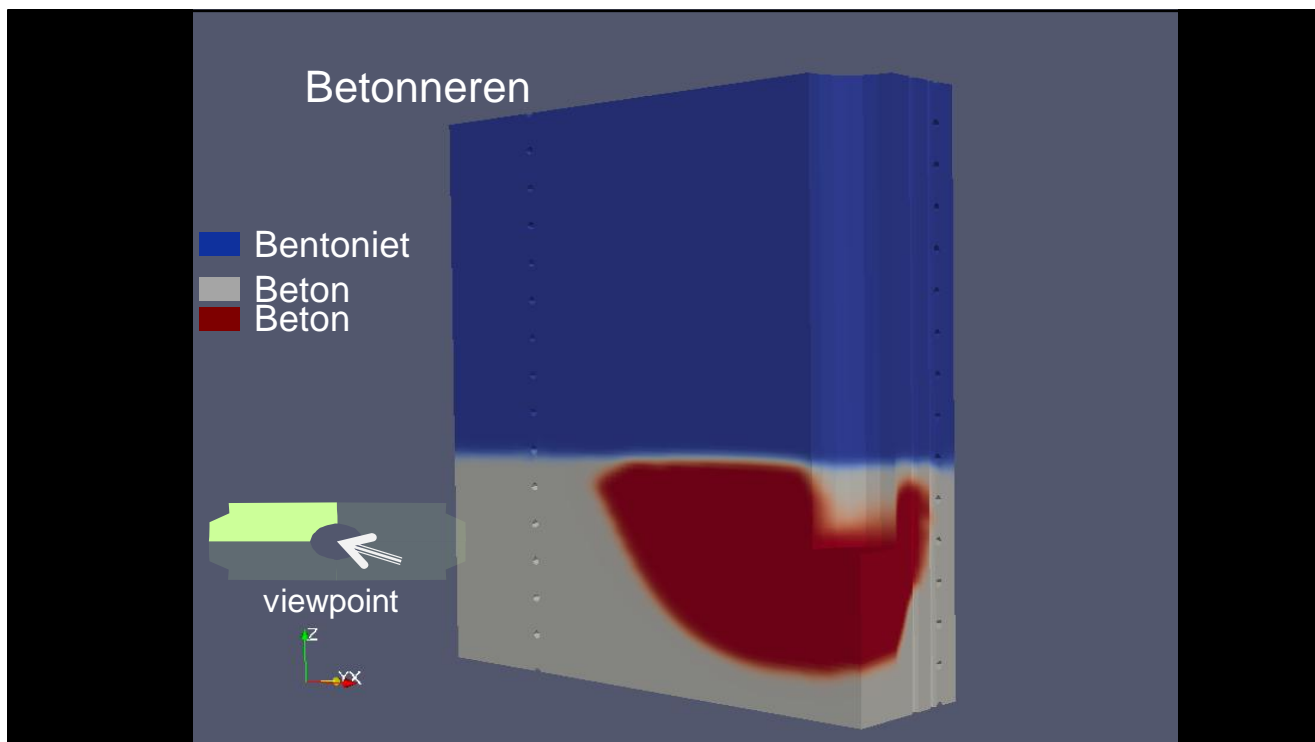
Model simulatie betonneren:

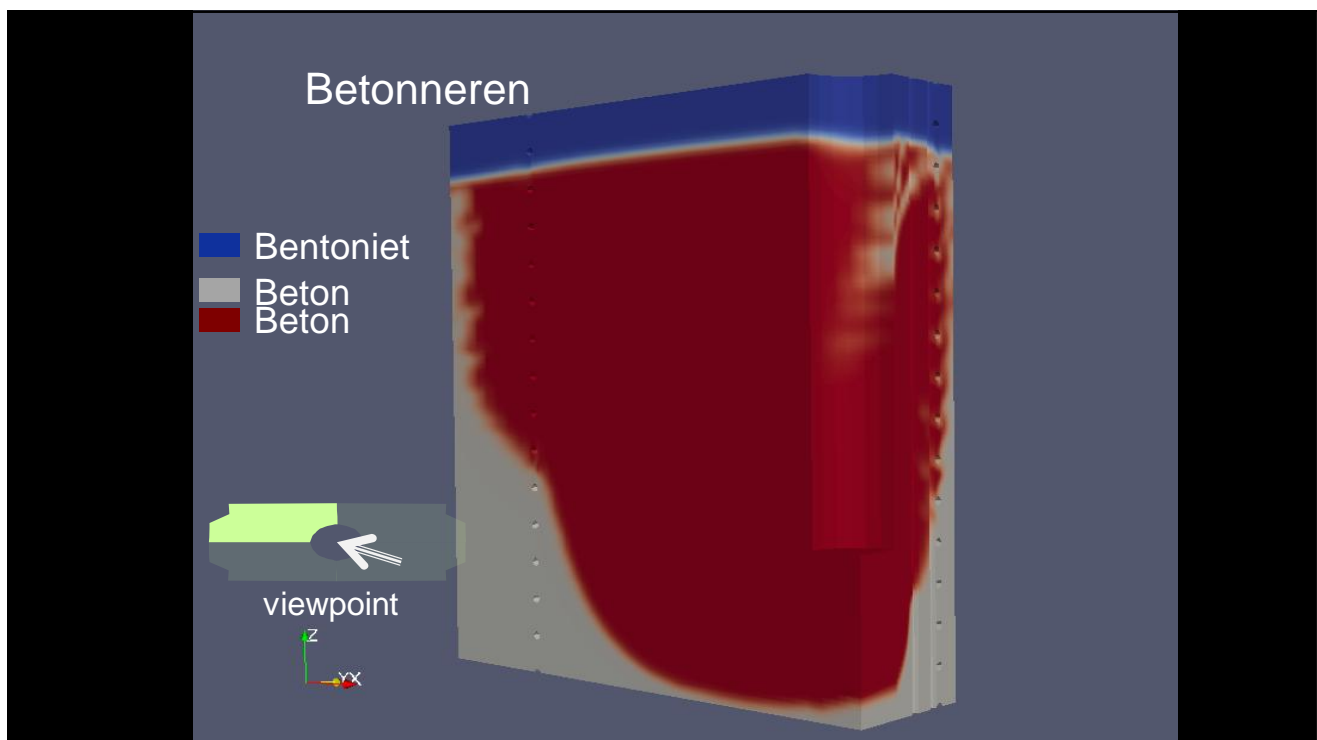
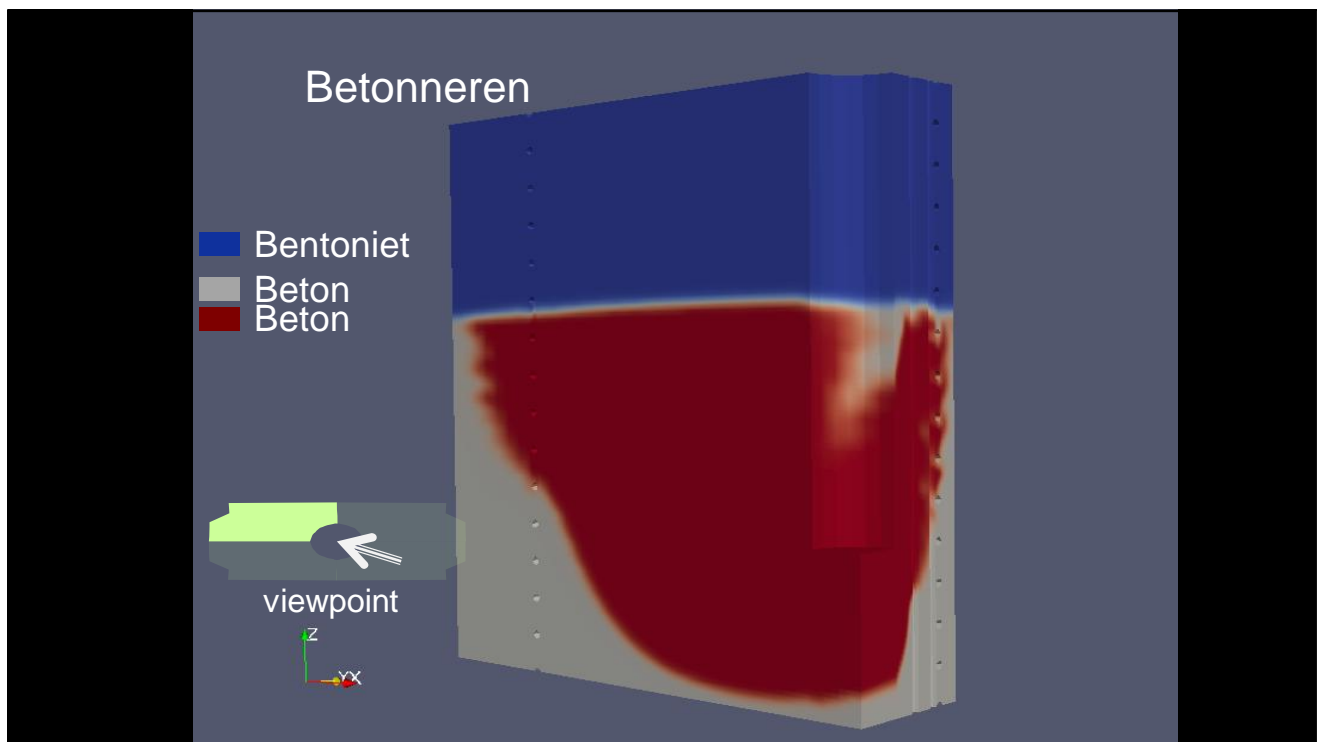


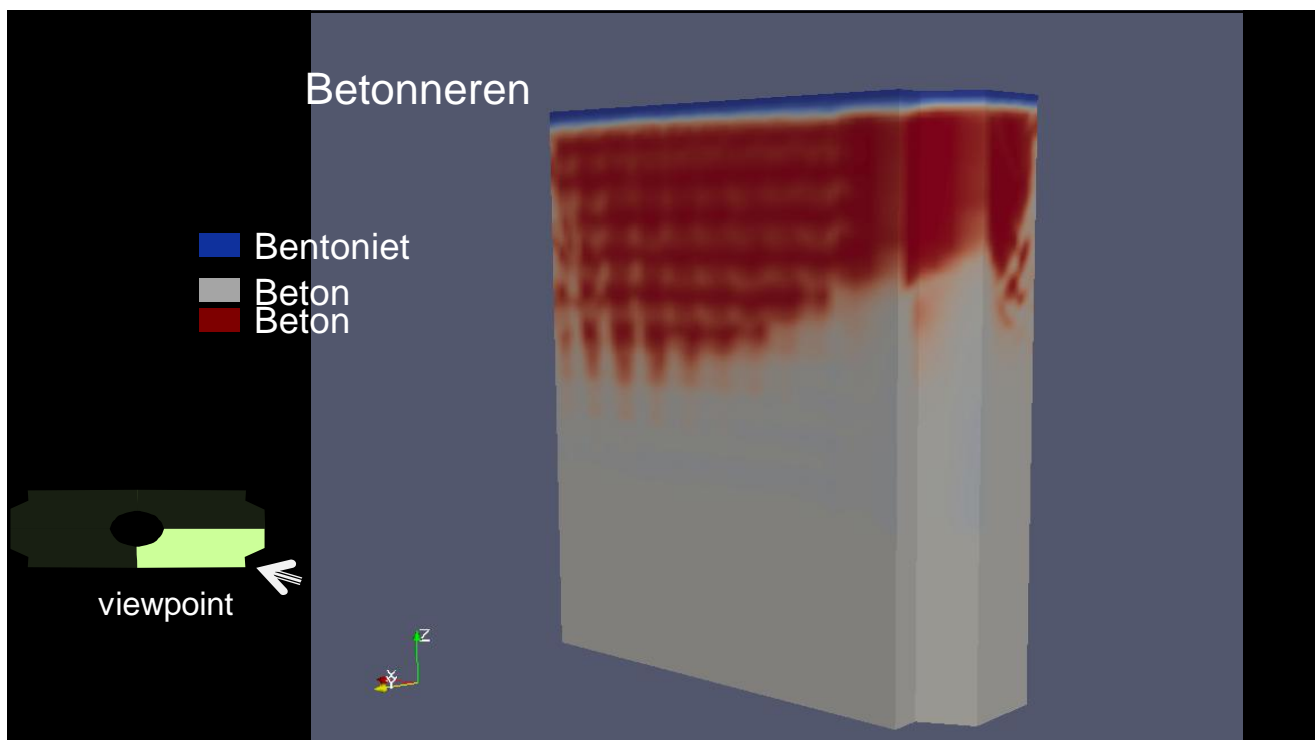
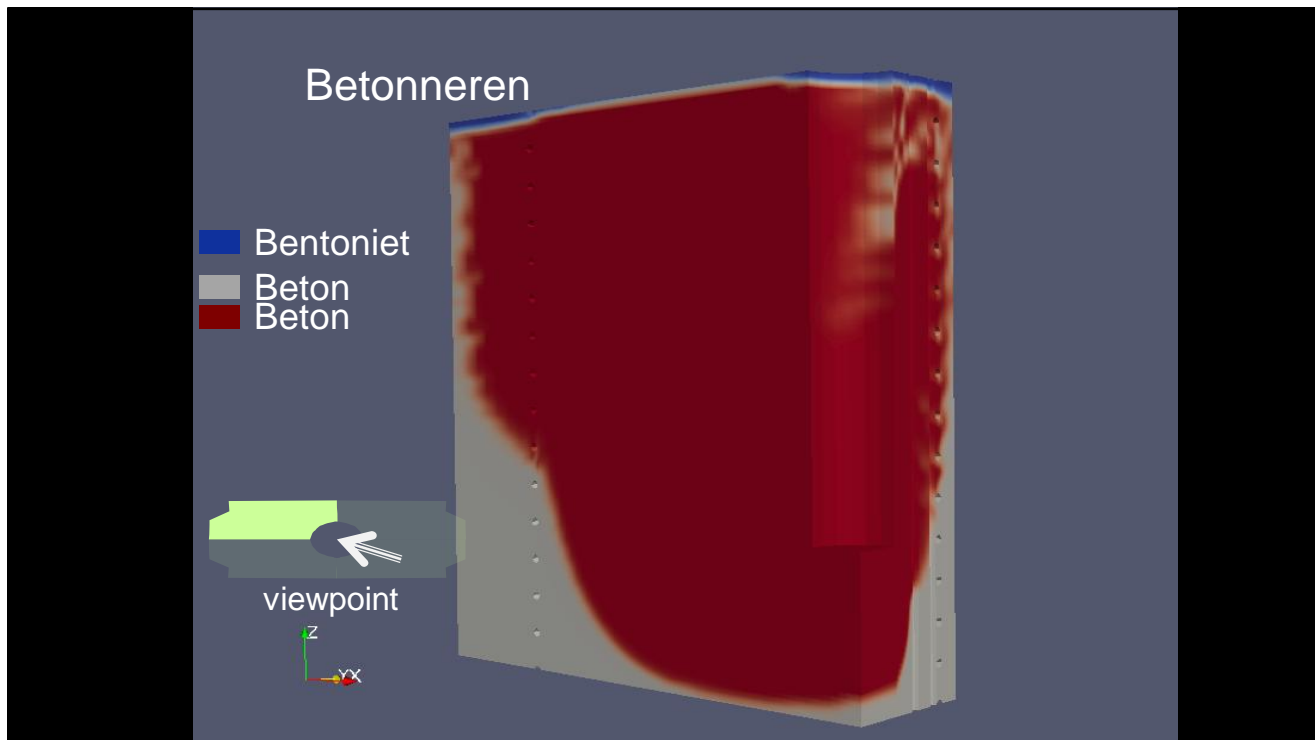
Betonneren

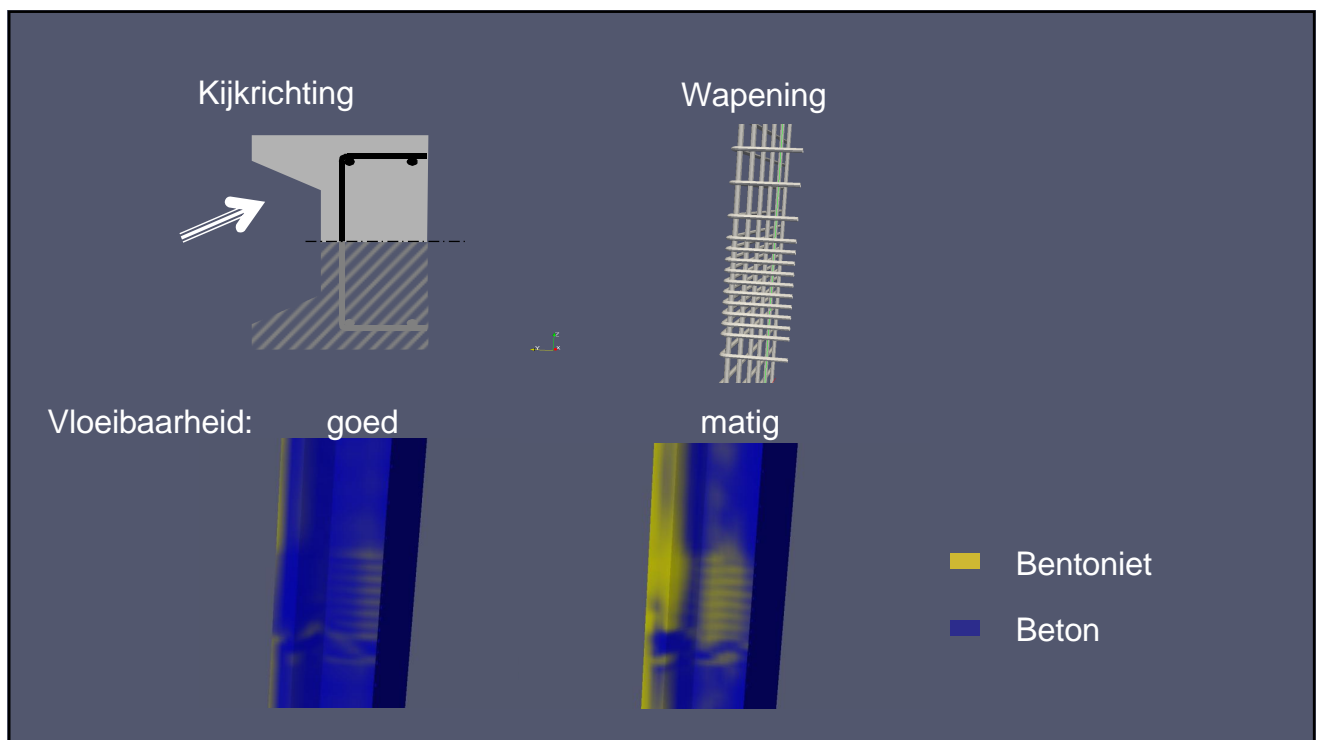
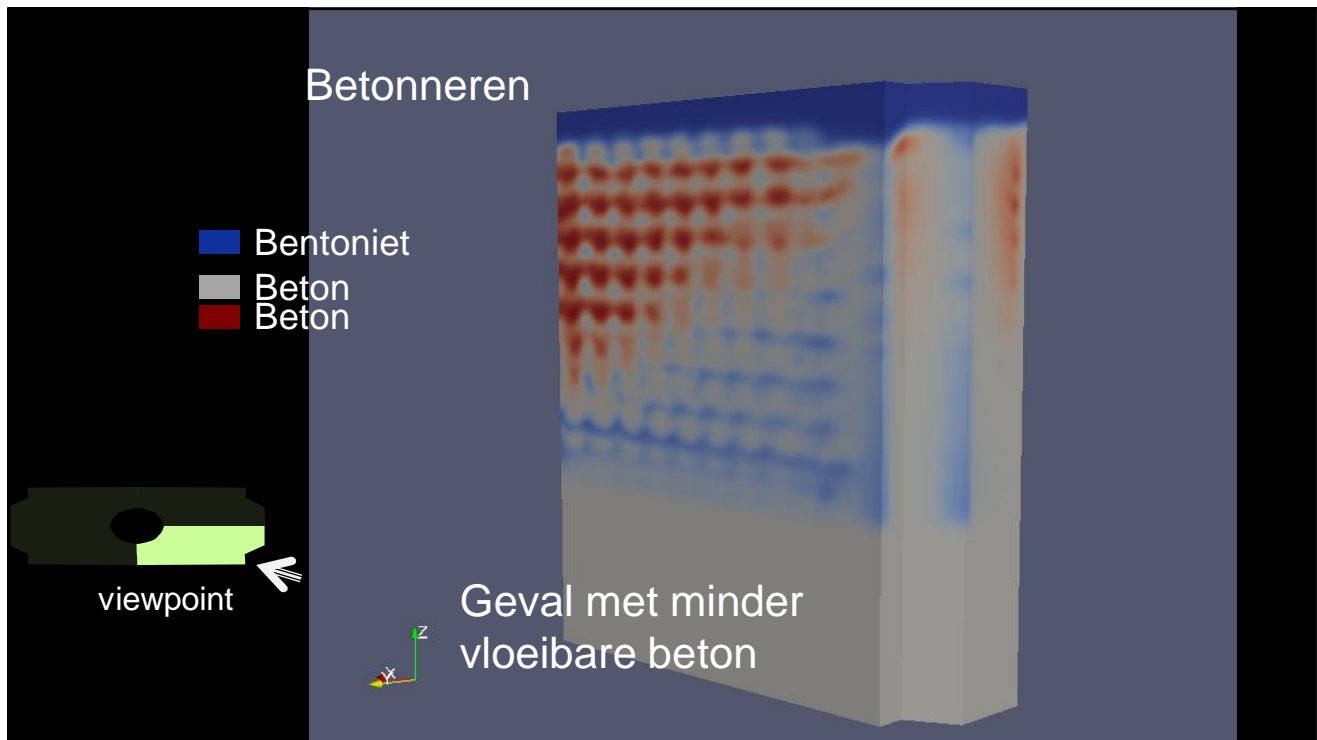
■ Bentoniet
■ Beton



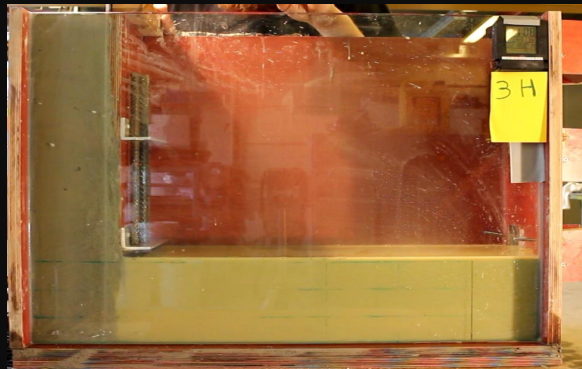








Validatie numeriek model: twee-fasen L-box test

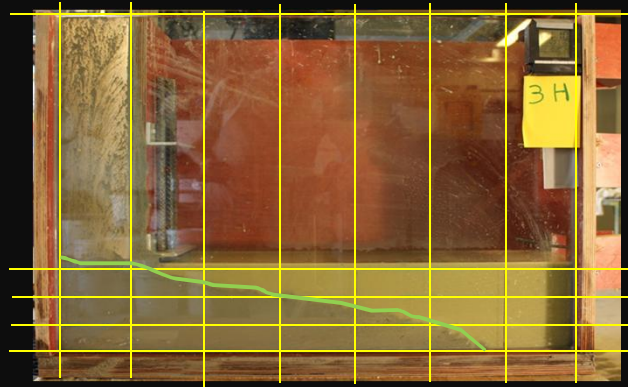


Validatie numeriek model: twee-fasen L-box test



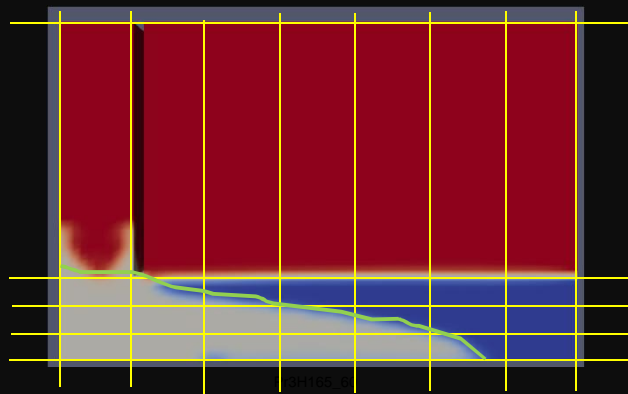
3H

Validatie numeriek model: twee-fasen L-box test



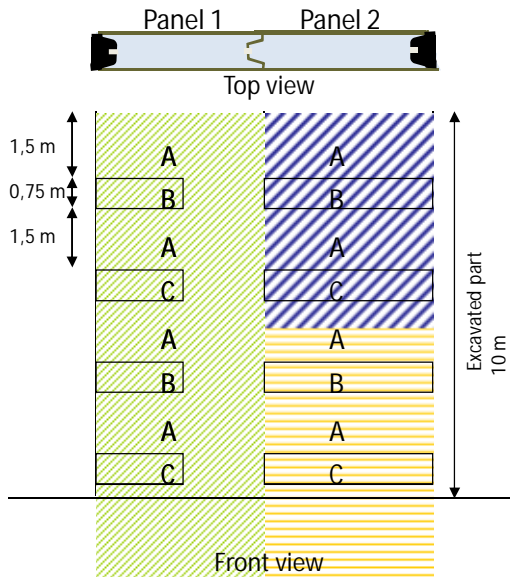
3H

Validatie numeriek model: twee-fasen L-box test



3H165_61

Praktijkproef Spoorzone Delft



Afstanden wapeningsstaven

A: Ruim

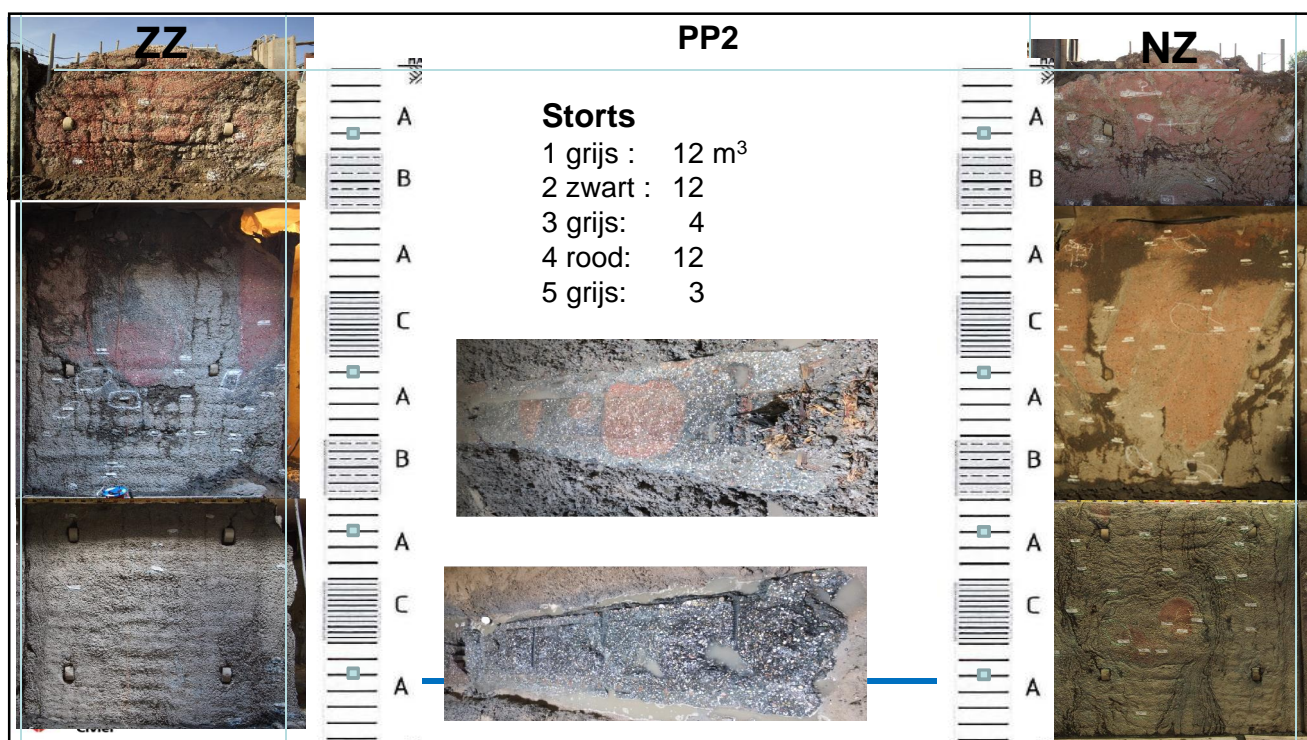
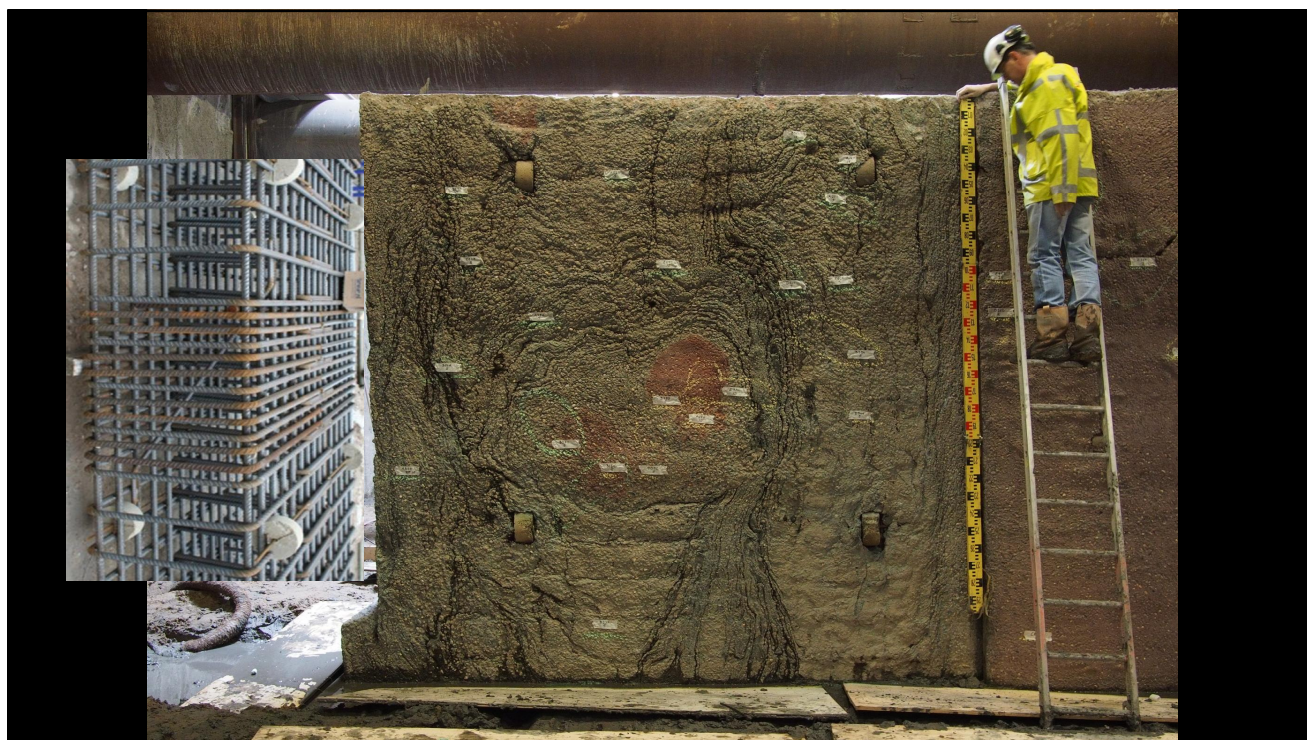
B, C : Verkleind

Vloeibaarheid beton en bentoniet:

	bentoniet: goed
	beton: goed
	bentoniet: matig
	beton: goed
	bentoniet: matig
	beton: matig

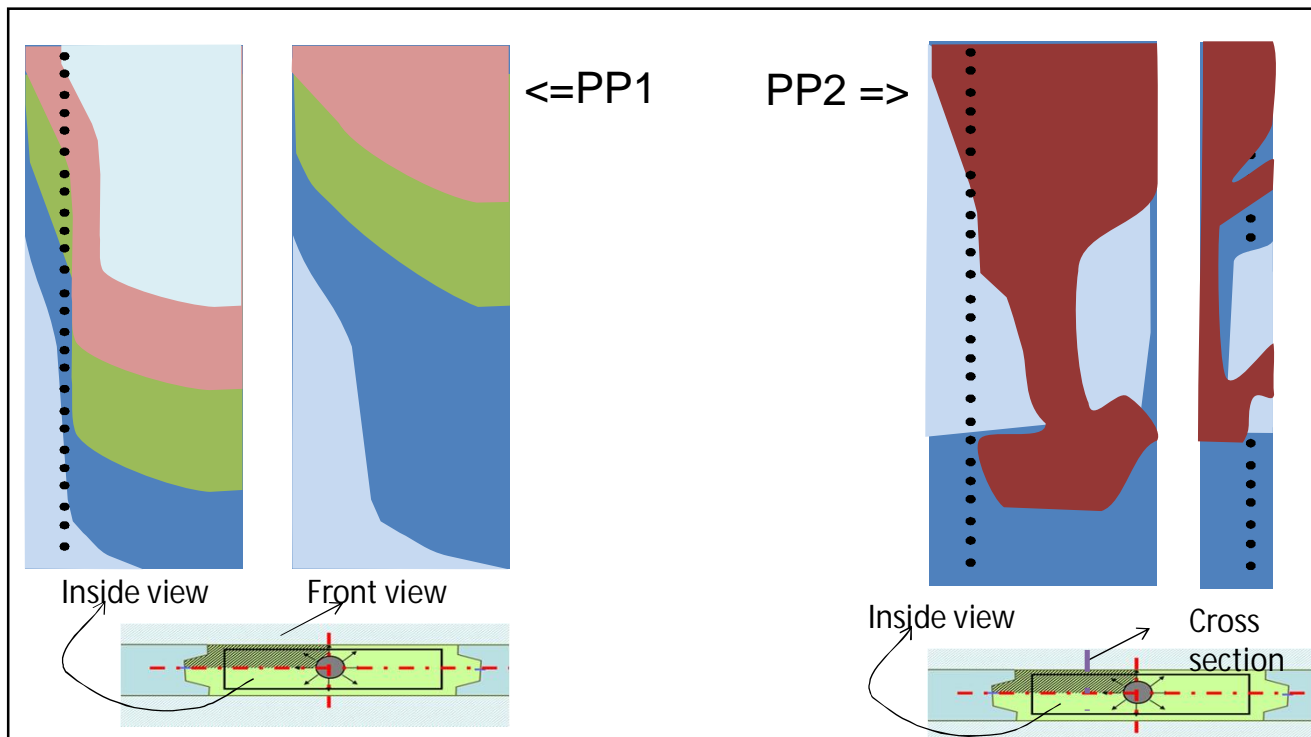
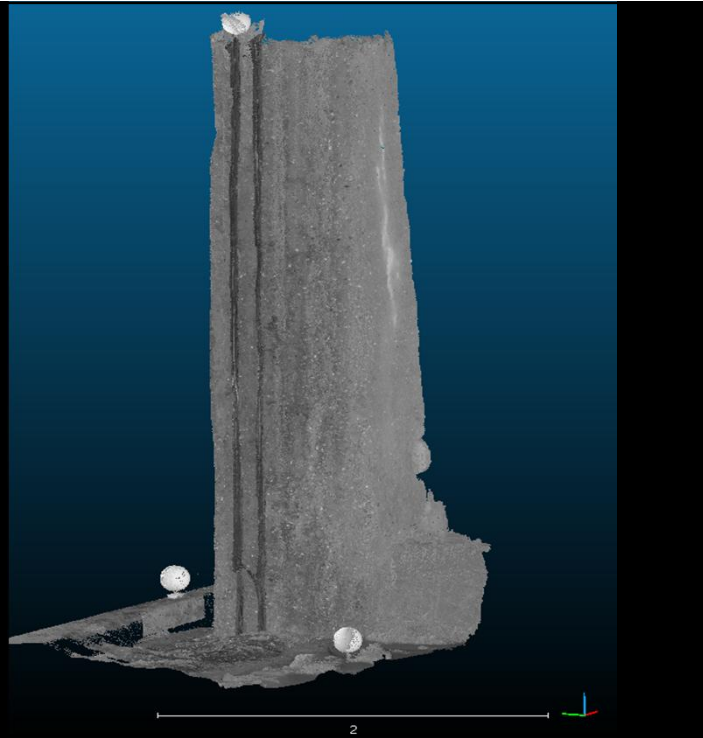




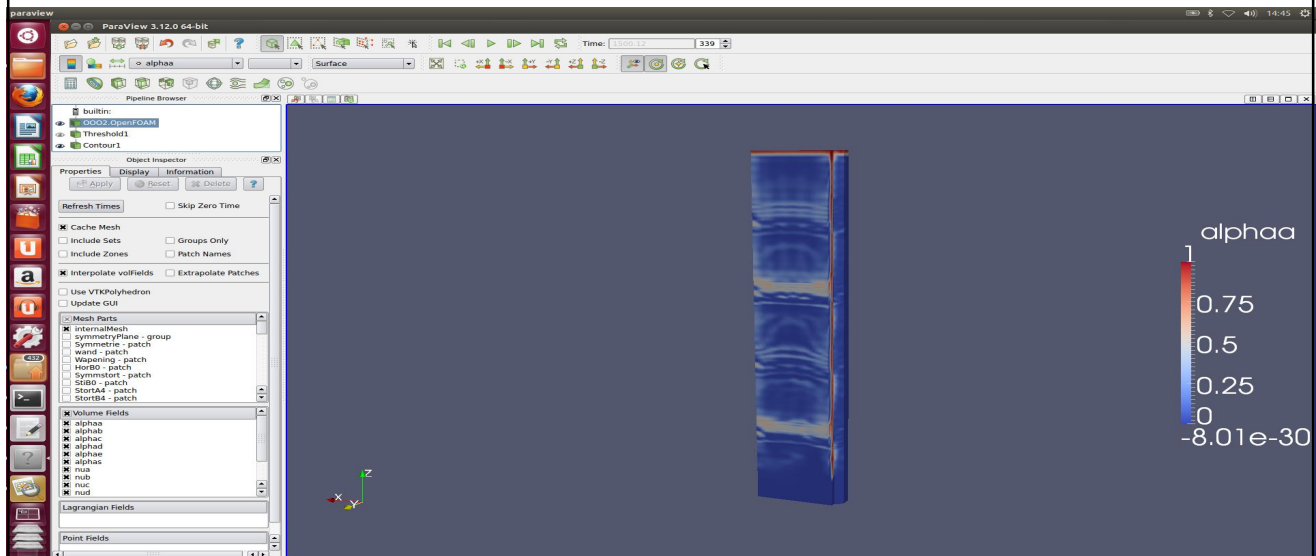


Laserscan

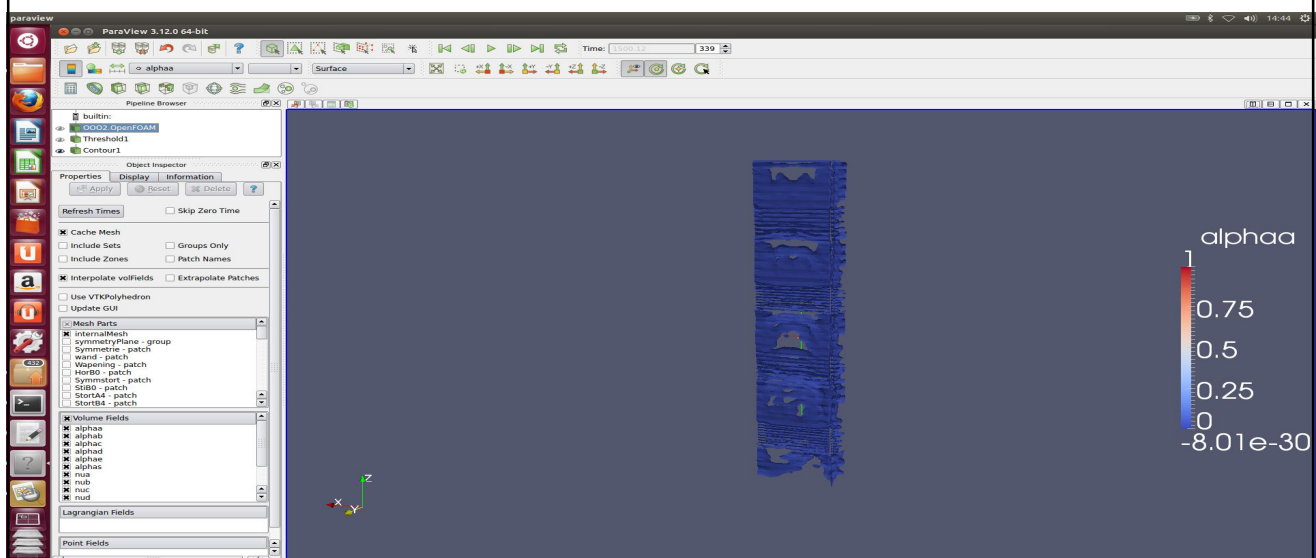
Voeg tussen de 2 panelen



Simulatie test panelen



Simulatie test panelen





Conclusies

❖ Beter begrip invloed van:

- Vloeibaarheidsparameters
- Geometrie

❖ Verbetering richtlijnen voor ontwerp en uitvoering

Belangrijkste toevoegingen:

- Diepte van de tremie pijp in relatie tot wapenings concentraties
- Toestaan van lokale wapeningsconcentraties
- Aanbevelingen over hoe om te gaan met minder vloeibare beton

❖ Gevalideerd simulatie model beschikbaar als Open source



Producten

- ❖ Voorstel tot aanpassing CUR 231 (Handboek Diepwanden)
- ❖ Handleiding OpenFoam model