Vibrations due to vibratory sheet pile driving – new field test

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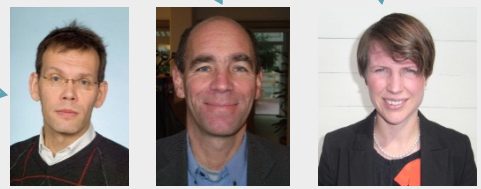
Project organization –
Vibrations due to pile and sheet pile driving

- Main people involved:
  - Industrial PhD-student: Fanny Deckner, *NCC/KTH Royal Institute of Techonolgy*
  - Main supervisor: Staffan Hintze, *NCC/KTH Royal Institute of Technology*
  - Supervisor: Kenneth Viking, *NCC*
  - A couple of Master students



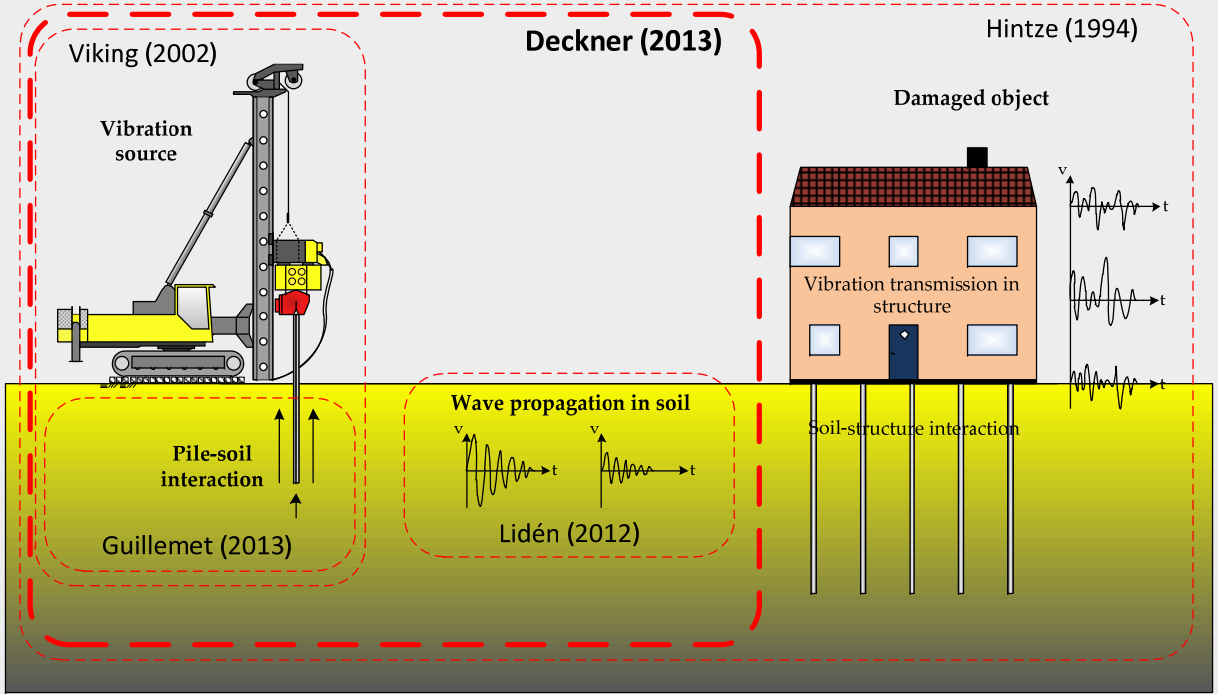
- Financial support:
  - Development Fund of the Swedish Construction Industry (SBUF)
  - NCC Construction Sverige AB
  - KTH Royal Institute of Techology
- Licentiate thesis April 2013
- Working towards doctor (prospective dissertation fall 2016)

Background

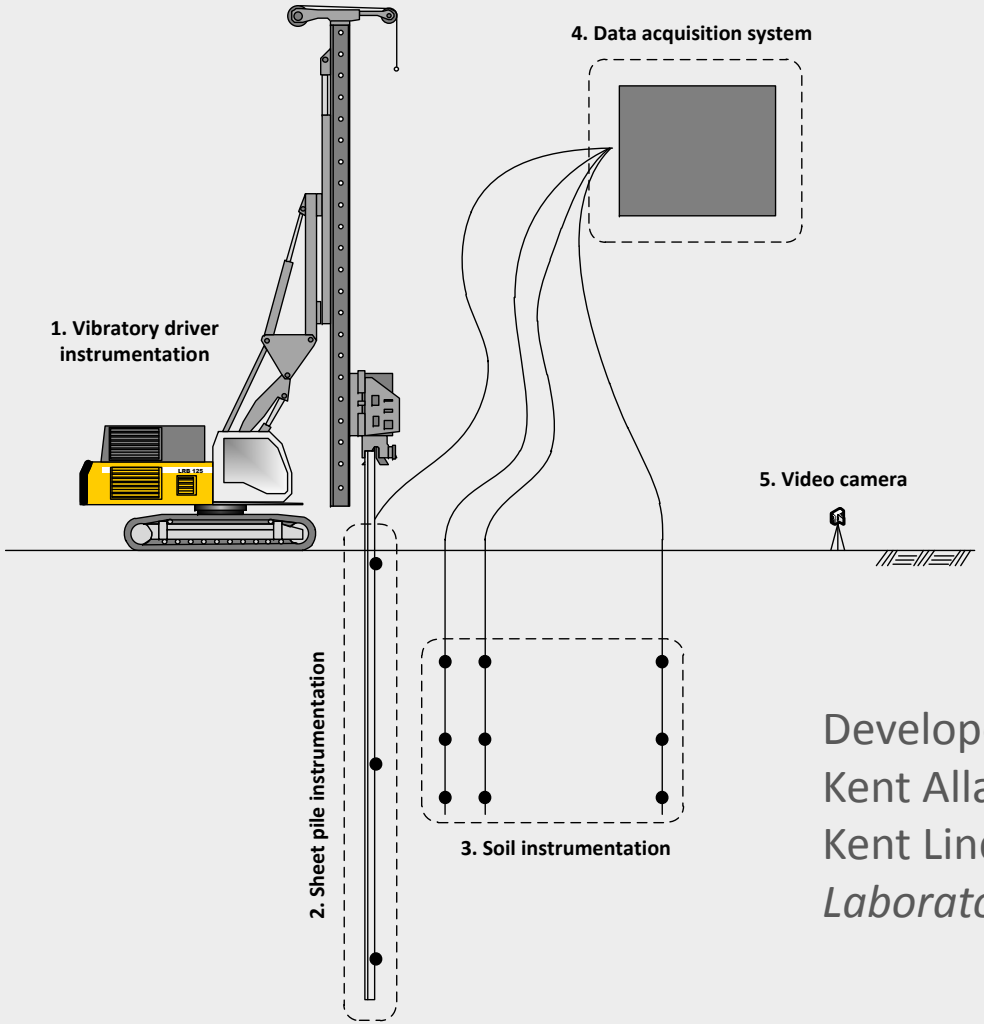
- Vibrations due to pile driving is a major concern for the construction industry
  - Damage to buildings, structures and equipment
  - Disturbance for humans
- Better prediction would be very beneficial for the construction industry
  - Over-estimation = costly
  - Under-estimation = costly

Current knowledge

- Common empirical relation (originating from Attewell & Farmer (1973))
- What is needed to be studied further for better prediction?
- One answer: Pile-soil interaction during driving



New instrumentation system – overview



Developed with assistance from Kent Allard, *Geometrik AB* and Kent Lindgren, *Wallenberg Laboratory KTH*

New instrumentation system - sensors

Soil instrumentation

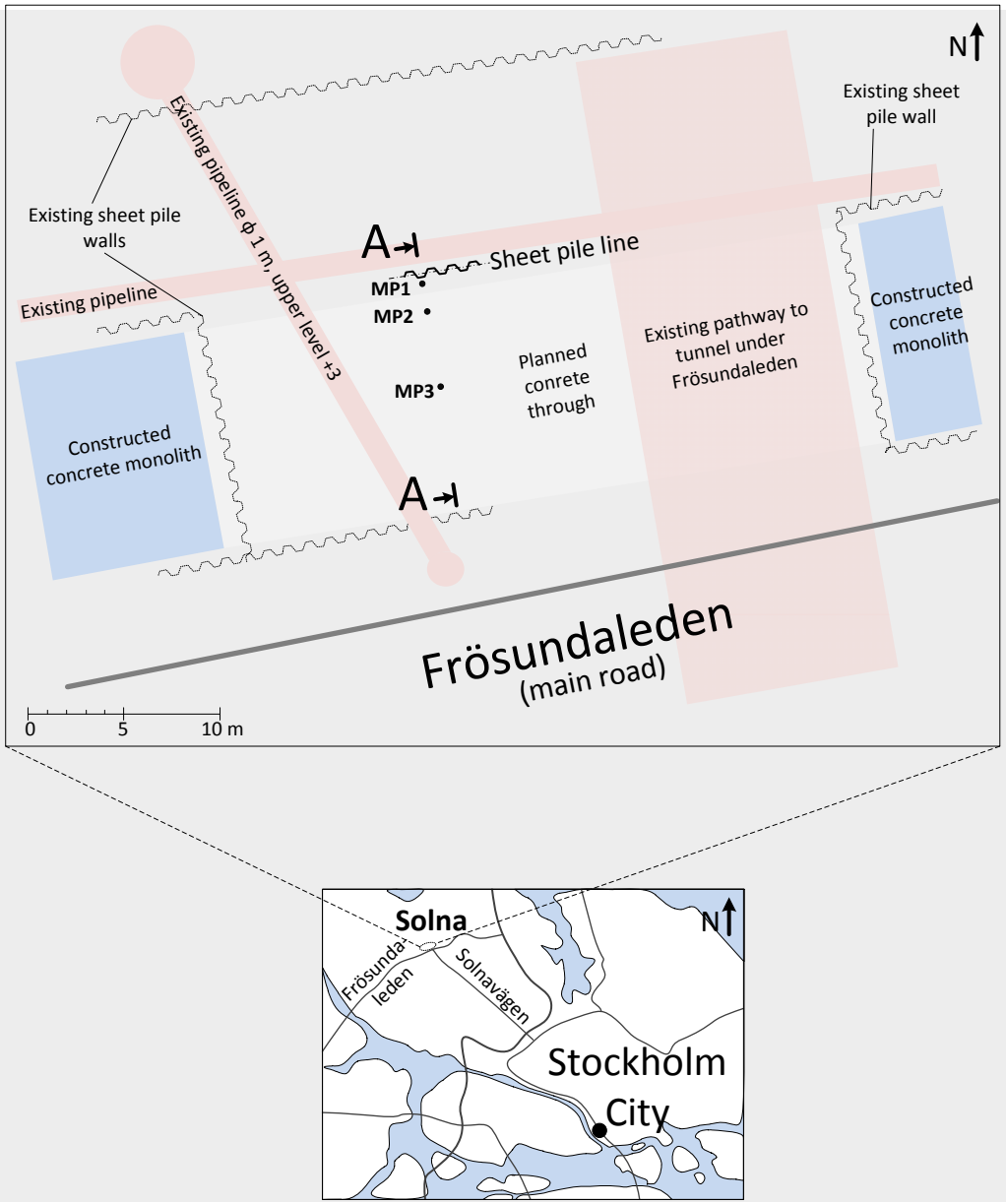
Sheet pile instrumentation

Field test Solna, Stockholm May 2013

- **Aim**: Study sheet pile – soil interaction
- **Aim**: Contribute to a platform for the development of a new prediction model
- Field test was assisted by Claire Guillemet (Guillemet, 2013)

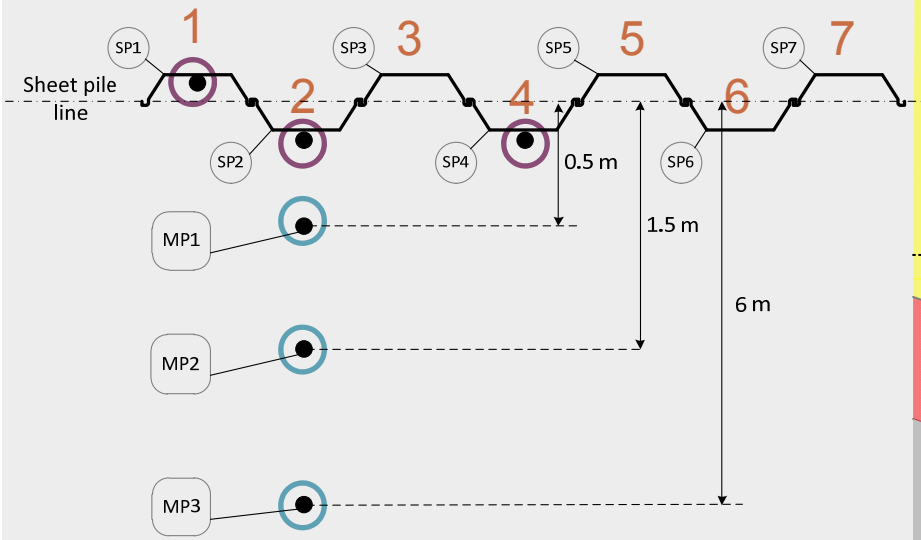
Site description

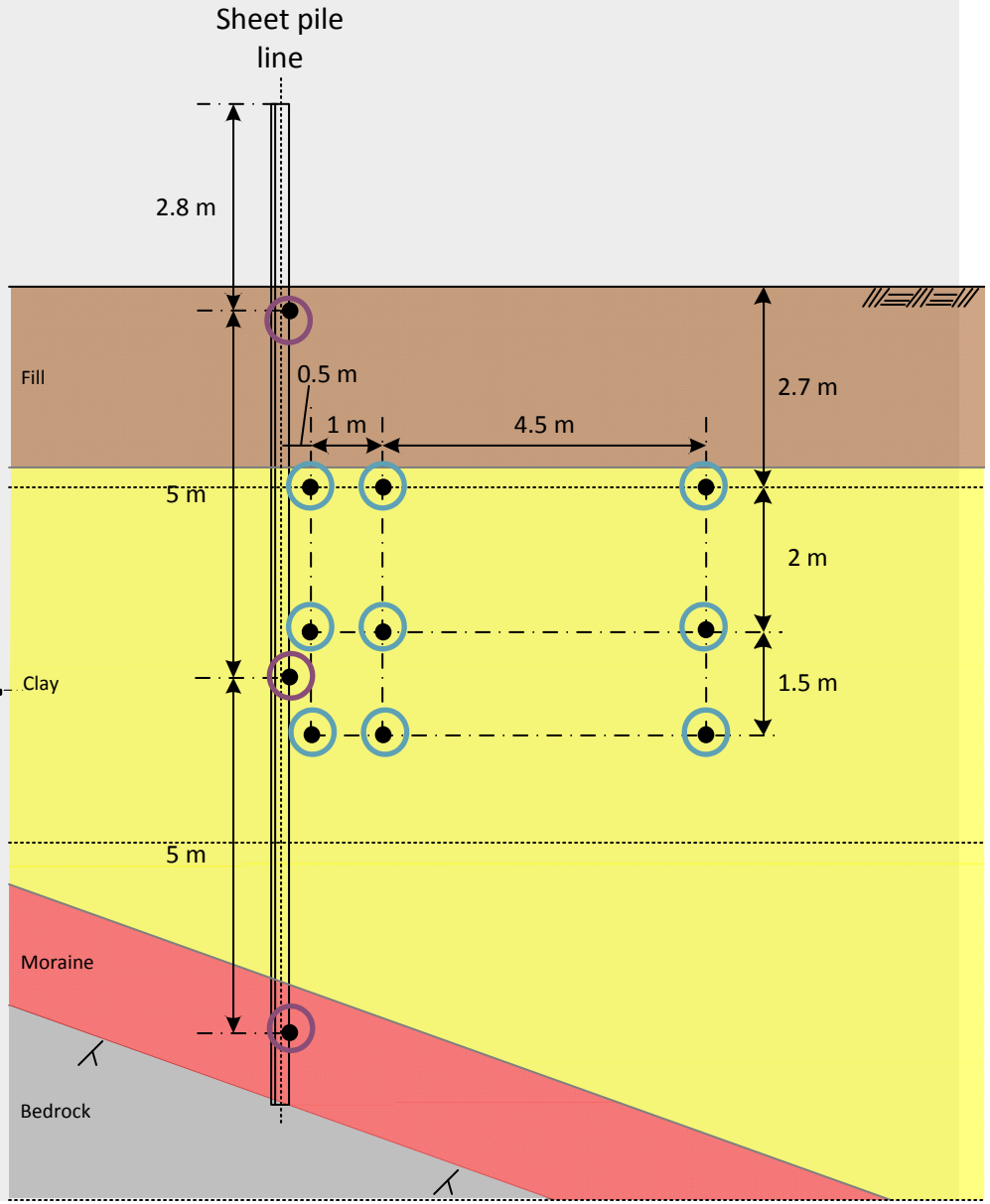
- Solna, ca 7 km north of Stockholm
- Construction of a new tramway



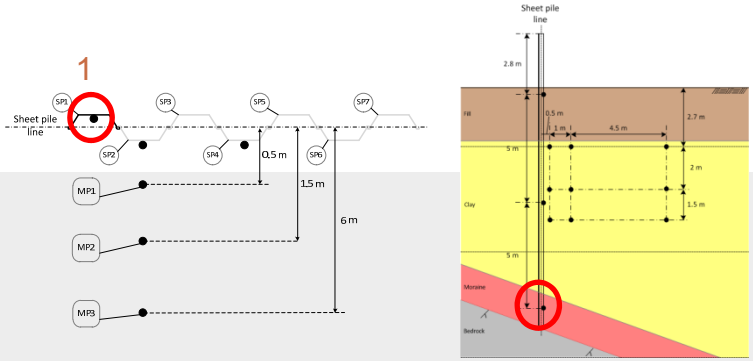
Test set-up

- 9 ground accelerometers
- 9 sheet pile accelerometers
- 7 measurement series

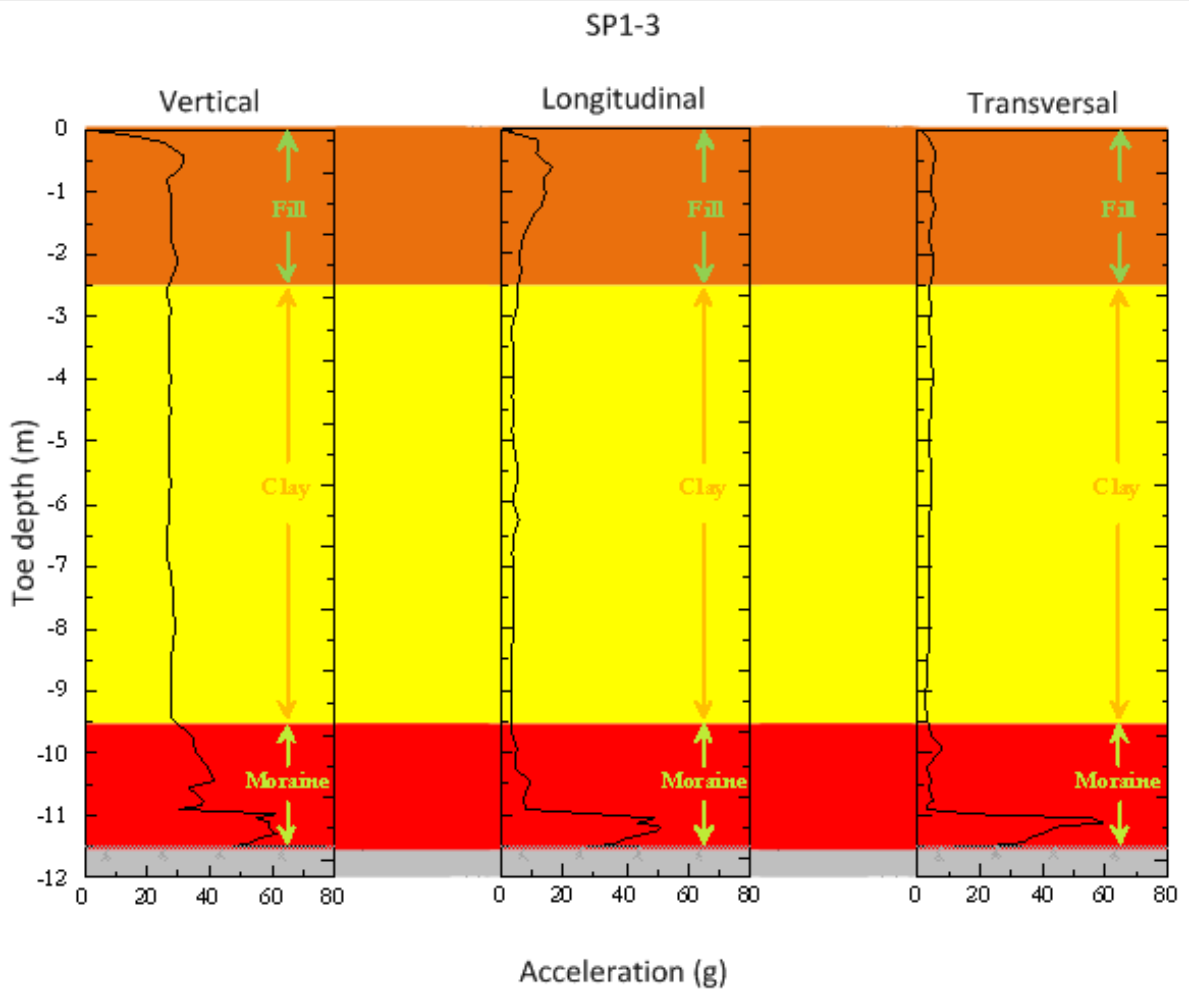




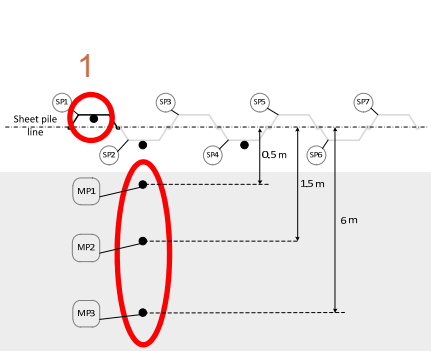
Results

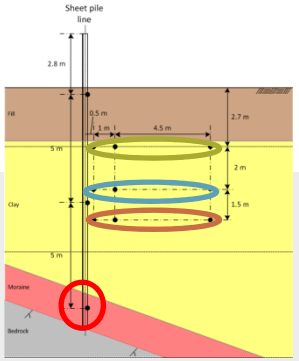


- Sheet pile vibrations during series 1
- Generally higher vertical accelerations during driving
- 50-60g in all directions at the end of driving

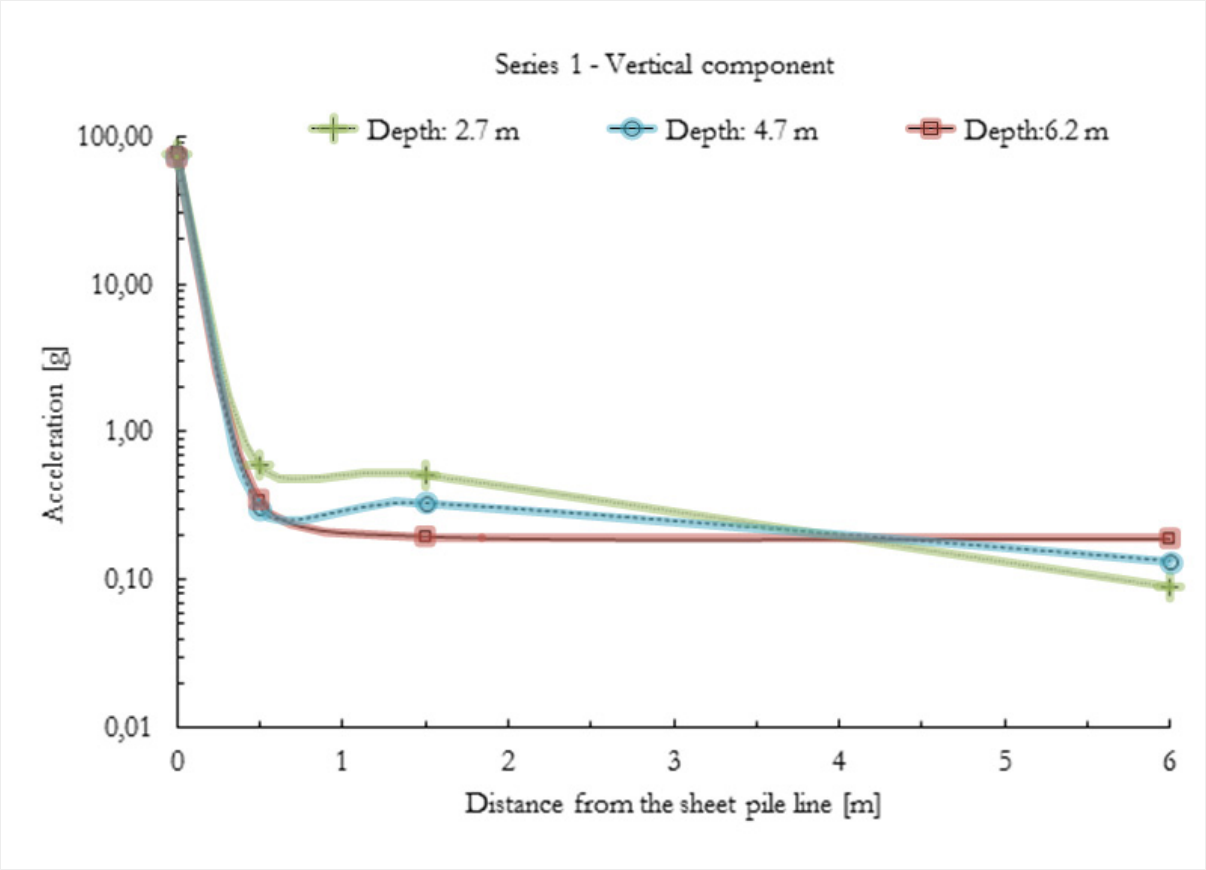


Results





- Attenuation with distance during series 1
- 90-99 % of the vibration magnitude is dispersed within the first 0.5 m



Conclusions

- New instrumentation system exceeded expectations!
- 90-99 % of the vibration magnitude is dispersed within the first 0.5 m

The conclusions are of great value both for the construction industry in contributing to better understanding and for the future of this research project.

Thank you for listening!

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