

# FinMeas



## Case Stockholms Hamnar

### Measurements ensure functionality of critical structures



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**FinMeas' automatic measurements ensure that the bored pile wall restraining the cave-in in Frihamnen's port area is working the way it should. Measurements help improve harbour safety and give new information to support upcoming investments.**

Frihamnen's quayside filled up on top of muddy seafloor. Erosion has caused soil settlement and the embankment has sunk into the seabed.

"At worst the waterfront fell into the sea 1-2 meters in a year", says construction manager **Peter Sundström**, who is in charge of the maintenance of Frihamnen's quayside.

Ground movements threatened to endanger the safety of harbour buildings in the area. Displacement of soil could also lower the maritime channel that goes right next to the quayside. Correspondingly the dredging of the maritime channel accelerated the displacement in waterfront embankments.

That is why plans were made in the harbour for stopping the ground movements. A Finnish engineering company Arcus Oy designed a bored pile wall which supports the embankment and stops its movements. This makes it also possible to continue the maintenance dredging, which is important for the maritime channel.

Passengerships to Riga and Saint Petersburg run from Frihamnen and it is used by approximately half of all the cruisers that arrive to Stockholm. Also a large container terminal is situated in the harbour.

**"Now we can monitor the wall's movements in real time and make sure that it is behaving the way the designers have planned it to work."**



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### Investing pays itself back

Building of the bored pile wall started in fall 2014. A bored pile wall in this kind of environment is a relatively new solution so the measurements were supposed to give information also about how the wall itself was working.

That is why FinMeas' automatic displacement inclinometers and anchor force sensors were installed in the piles of the wall, not in the ground.

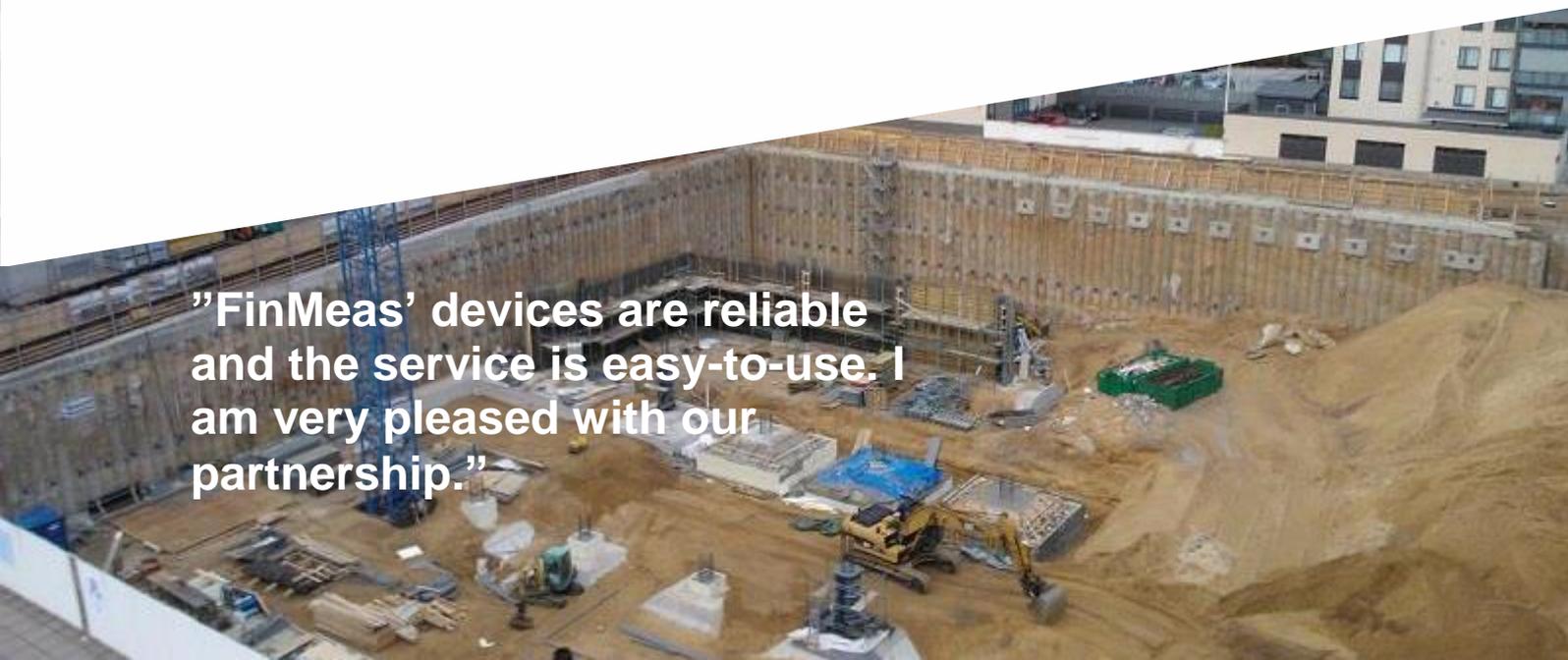
"Now we can monitor the wall's movements in real time and make sure that it is behaving the way the designers have planned it to work", says Sundström.

The bored pile wall is altogether 60 meters long and 30 meters high. Water level around the wall varies from 6 to 12 meters.

The measurements indicate that the structure is working: the ground movements have been stabilized.

"According to the measured data the bored pile wall seems to be an extremely well-working solution for this kind of problem. This is important for us to know because similar challenges exist also in other parts of the harbour area. This is why investing to FinMeas' measuring technology will pay itself back", says Sundström.

Stockholms Hamnar is currently developing Värtahamnen's and Frihamnen's area together with the city of Stockholm. New apartments and business premises are being built in the area and some of the current docks will be filled. The quayside will be extended further to the bay.



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### Reliable and easy-to-use solutions

Sundström appreciates the real time information given by FinMeas' automatic measuring devices. Arcus monitors the wall movements but also Sundström regularly visits FinMeas' webservice to check measuring data.

In Arcus Oy, hydraulic engineer Kim-Andersson Berlin takes care of following the measuring data and modeling the structures. According to him, monitoring structures during a project is more common in Sweden than it is in Finland. It is used specifically to improve working safety.

Andersson-Berlin thinks that the measuring results of Frihamnen's bored pile wall awakens also academic interest in larger scale because reliable information of similar structures is not commonly available.

Sundström is pleased with both the wall's and the measurements' functionality.

"FinMeas' devices are reliable and the service is easy-to-use. We have had a good co-operation. They are experts in their branch and I am very pleased with our partnership."

**" Investing to FinMeas' measuring technology will pay itself back."**

Movement since 30.09.14

