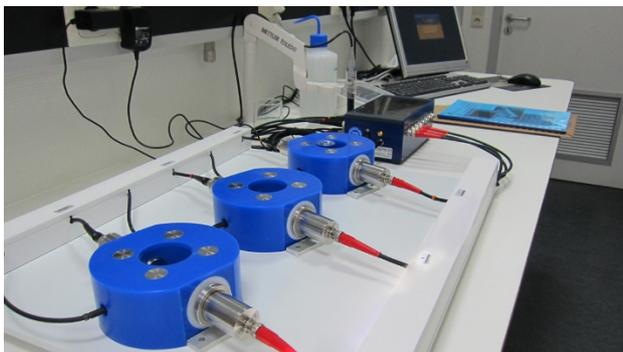


# Monitoring concrete hardening with ultrasound

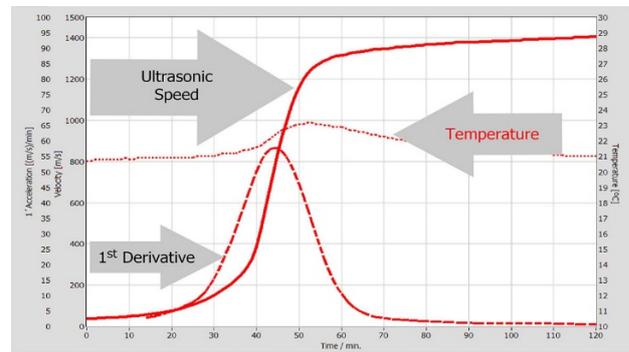
Master's project for the Master Program Structural Engineering and Building Technology

## Background

Concrete is a material that gradually transforms from fluid to solid as the cement reacts with the water and hydrates. As the hydration and hardening process is fundamental to contractors and engineers it is vital to be able to describe this hardening process (e.g. the tool PPB<sup>1</sup> for contractors). Traditionally, this has been done by conducting test which first assess the penetration resistance (e.g. ASTM C 403) followed by compressive strength test from an early-age. To do this is time consuming but it also only gives partial information depending on how frequently the measurements are conducted. However, using a ultrasonic measuring system it is possible to continuously monitor the early hardening process.



(a)



(b)

Figure 1. (a) Ultra sound testing equipment. (b) Test results showing the change in ultrasonic speed.

## Purpose/Method

This master thesis proposal aims to investigate the correlation between ultrasonic measurements and the conventional methods for setting and early strength. This will be done for different types of concrete (with and without supplementary materials and accelerators) as well as effects of ambient temperature.

## Impact

A better understanding of the concrete hydration and hardening process, which is essential for contractors for planning their concreting and curing. This is a direct response to the growing need for material specialists who understand concrete, how this behaves from an early-age to the hardened state and how this can be described more accurately.

## Thesis setup information

The master thesis will be carried out at Thomas Concrete Group in collaboration with Chalmers University of Technology. This Master Thesis work will be part of an ongoing project and is suitable for students interested in concrete technology, experimental work and theoretical modelling.

### Supervisor team:

Oskar Esping (PhD). [oskar.esping@c-lab.se](mailto:oskar.esping@c-lab.se)

Ingemar Löfgren (Adj. Professor, Chalmers) [Ingemar.lofgren@thomasconcretegroup.com](mailto:Ingemar.lofgren@thomasconcretegroup.com)

Examiner Chalmers, Prof. Tang Luping [tang.luping@chalmers.se](mailto:tang.luping@chalmers.se)

<sup>1</sup> <https://sbuf.se/ppb/>