

4. FATIGUE OF CONCRETE

Description

Progressive, permanent structural damage occurs in (plain) concrete when subjected to time fluctuating stresses and strains. This process is called fatigue and has been under investigation for more than a century with most studies being phenomenological. This study focuses on the fundamental nature of fatigue with emphasis on the initiation and development of fatigue damage in concrete.

Aim and objectives

The aim of this project is to investigate the fundamental nature of fatigue damage in concrete, i.e. initiation and development of fatigue damage under cyclic compressive loading. For the characterisation of fatigue damage, digital image correlation techniques as well as μ -CT analysis will be used. The following objectives are defined in this project:

- 1- Summarize and categorize the existing literature on fatigue damage in concrete.
- 2- Preparation and testing of concrete specimens under cyclic compressive loading.
- 3- Analysis of test results from digital image correlation techniques and μ -CT analysis to visualize initiation and development of fatigue damage.
- 4- Preparation of report.

Methodology

In order to fulfil the abovementioned aim and objectives, the study will comprise the following tasks:

- 1- Literature review: Identification, classification and summary of scientific literature
- 2- Preparation and testing: Casting of concrete specimens in concrete lab and testing of specimens in a standard test-rig in building 119
- 3- Analysis of results: Descriptive statistics of the experimental data, image analysis, and exploration of μ -CT scans (tutorials will be provided).

Minimum requirements

The project is oriented to MSc education level, preferably a group of 2 students. The students are expected to be able to work independently on theoretical, organizational and practical level (introduction to tasks will be provided). The specific requirements for accessing this project are:

- 1- Proficient English level on a technical basis: understanding of scientific and technical literature
- 2- Intermediate-level programming skills (e.g. Matlab, Python) and intermediate-advanced informatics skills (text processing, excel etc.)
- 3- Intermediate-level on statistics (exploratory statistics at BSc/MSc level)
- 4- Basic understanding of electronics and mechanical components
- 5- Advanced understanding of concrete technology and mechanics of materials

Remarks on experimental project: Students will need to have a reasonably free schedule, and will have to prioritize project activities over other obligations. Extra ECTS may be added to the project upon agreement.